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Making Parts of a Nine-Cylinder Motor

BY FRED H. COLVIN
Editor, *American Machinist*

Fixtures and tools for a three-part crankcase—Combination boring and drilling fixtures used in making the Lawrance airplane engine

THE CRANKCASE of the Lawrance airplane engine consists of three portions, each being an aluminum casting. The front cover contains the magneto-drive gearing, the deep-groove Hess-Bright radial type thrust-bearing, and carries supporting brackets for the magnetos on each side of the crankshaft. This front piece, as well as the location of the magnetos, can be seen in place in Figs. 11 and 12. The intermediate case or cover, containing the gears and countershaft for driving the cam, the cam disk, the cam followers and their guides, has a solid web at the back which supports an S.K.F. self-aligning ball bearing which forms the front main bearing of the crankshaft. This construction allows easy inspection of all the cam operating mechanism while it is in place with all gears, by simply removing the front cover.

The main crankcase is a circular drum and has nine main openings through which the steel cylinder liners project. There are also nine flat faces to which the cylinders are bolted. There is a wall at the back of the crankcase proper and behind this a conical extension used in mounting the engine to the fuselage.

The first operation on the crankcase is facing and turning the conical extension and boring the main-bearing hole, which is done on a Gisholt lathe. The crankcase is then reversed and the front end turned and faced, locating from the main bearing hole. The horizontal boring, which also includes the facing of the flat surfaces to receive the cylinders, is done on an indexing fixture on the boring machine table as shown in Fig. 1. The other holes with the square flanges are for bolting on the carburetor connections and are also bored and faced at the same setting. More details of the boring fixture and also of some of the cutters used can be seen in Fig. 2. Both views also show the smaller opening for the inlet-pipe manifolds for the nine cylinders.

Some of the drilling operations of the main crankcase are shown in Fig. 3. The case is mounted on a central stud *A* which is mounted on the angle plate *B*. The plate which carries the drill bushings is located from the boring operation previously performed. The drill is shown at work on the cylinder bolt-holes, while the case on the floor at the left has the fixture in place for drilling one of the small carburetor flanges.

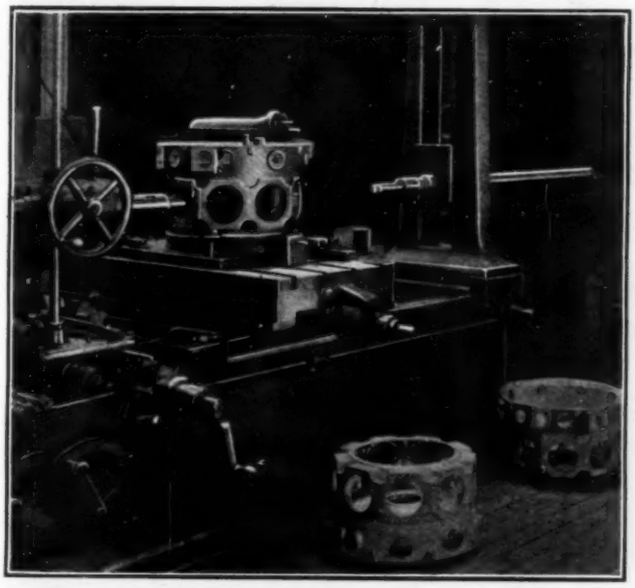


FIG. 1—MACHINING THE CYLINDER BASE

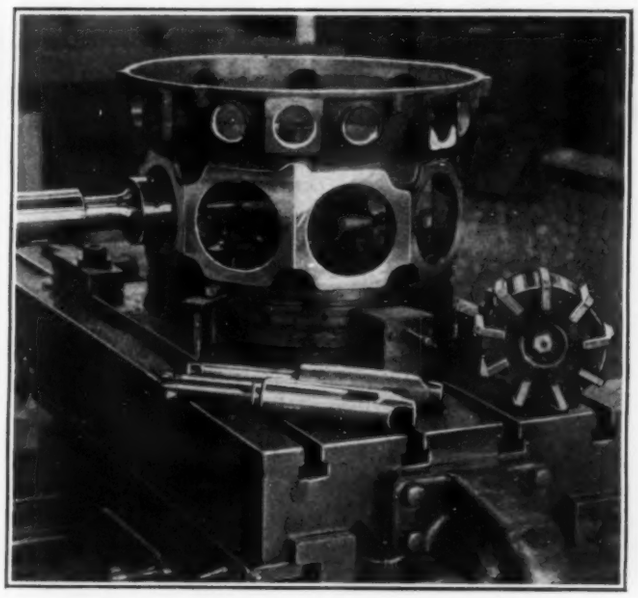
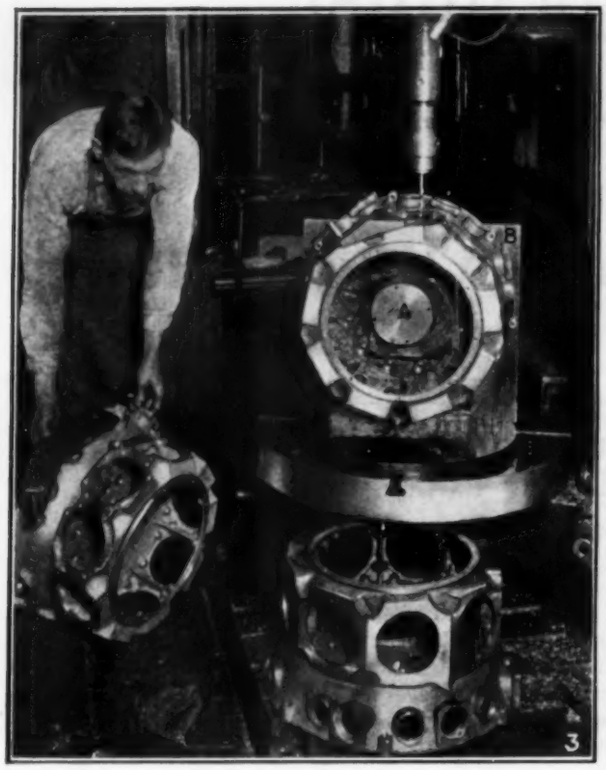
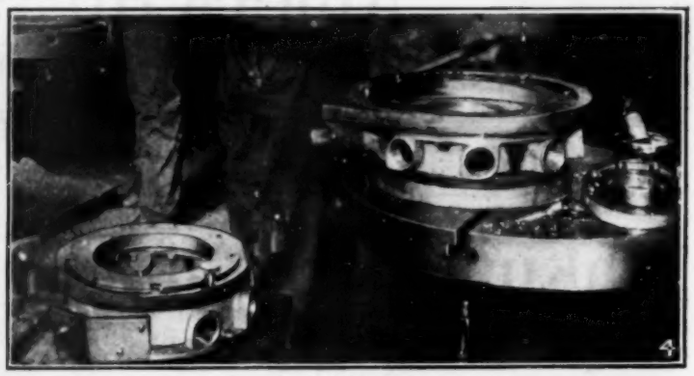


FIG. 2—DETAILS OF BORING FIXTURE





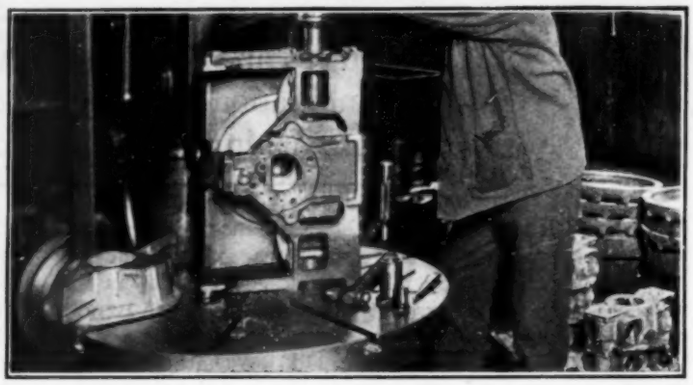


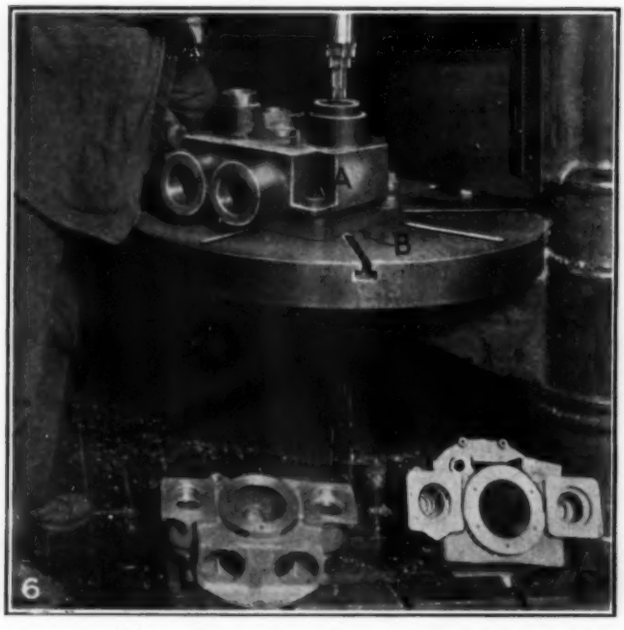
FIG. 3—DRILLING FOR CYLINDER STUDS. FIG. 4—DRILLING THE INTERMEDIATE CASE
FIG. 5—COMBINATION DRILLING AND BORING FIXTURE

Another drilling operation on the intermediate case which carries the valve rod guides, is shown in Fig. 4. This view shows several different drilling fixtures although all are of the same type. It will be noted that location is by a stop pin fitting some previously drilled hole.

Boring and Drilling Crank Case Cover

A combination boring and drilling fixture for the front cover of the crankcase is shown in Fig. 5, in which the openings for the magneto drive are being reamed. It will be noted that this fixture locates the casting with reference to the magneto supports so as to insure the magneto drive being correctly positioned with reference to the gearing. It will also be seen that this same fixture handles the drilling of a number of the holes on the end of the ball-bearing housing.

A different type of boring fixture is shown in Fig. 6 for handling several operations on an aluminum casting which forms part of the engine equipment at the back. It will be noted that the fixture is in two parts, the body *A* being mounted on the base *B* but separated from it by a sufficient distance to allow chip clearance and the projection of the pilot of the boring tool, or



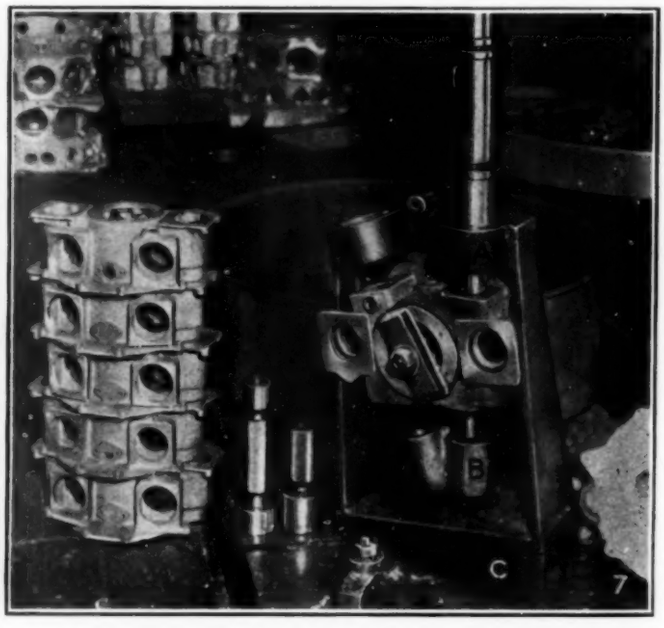
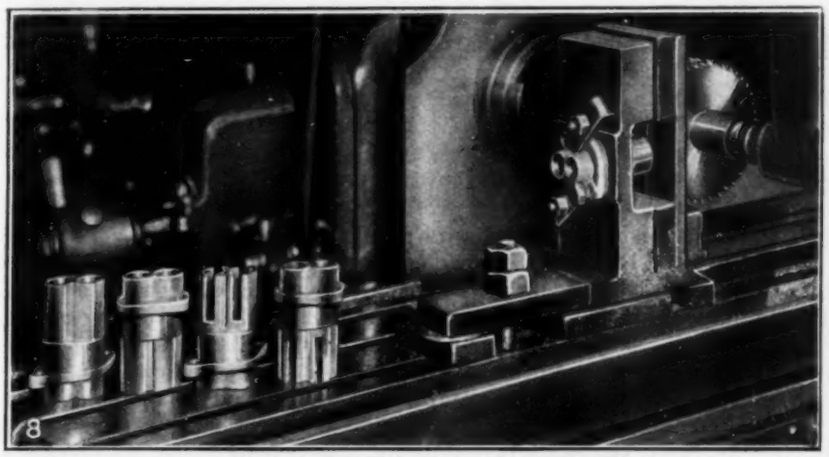
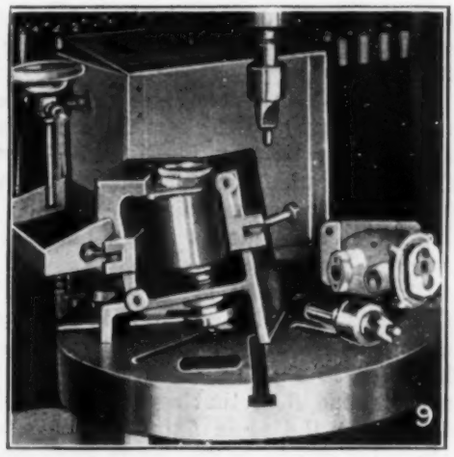


FIG. 6—FOUR-WAY BORING FIXTURE. FIG. 7—BORING HOLES AT AN ANGLE





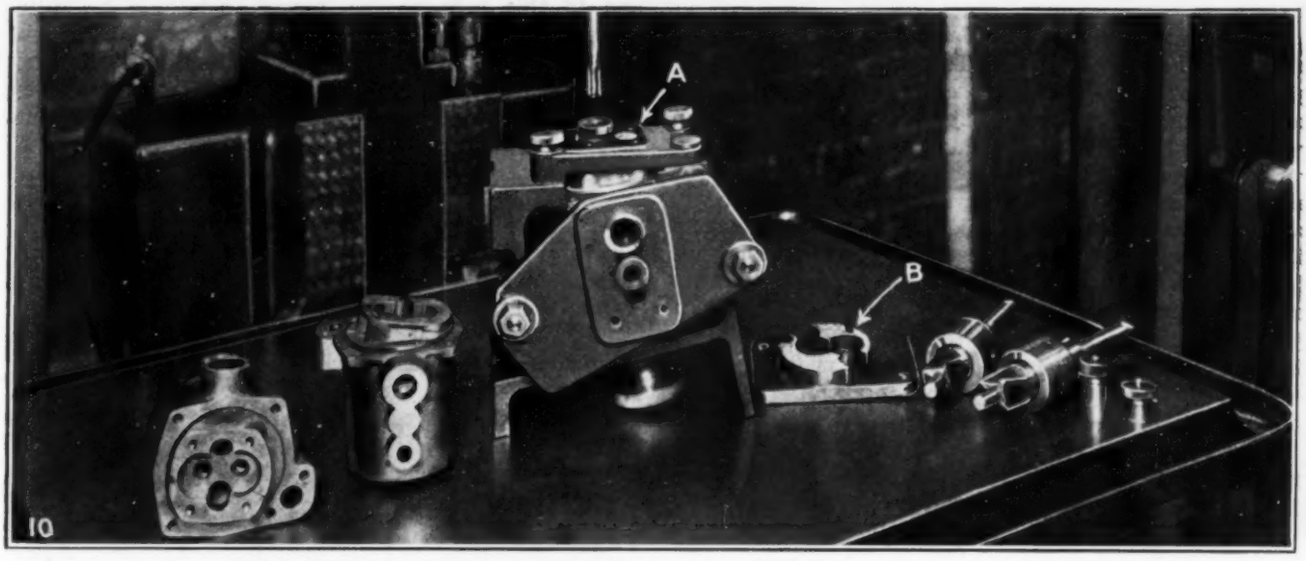
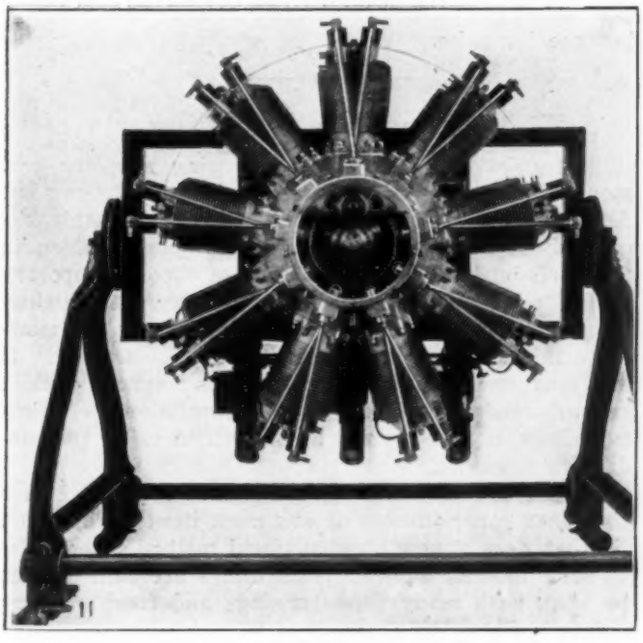


FIG. 8—MILLING VALVE GUIDE HOUSINGS. FIG. 9—BORING PUMP BLOCK. FIG. 10—ANOTHER BORING FIXTURE

reamer. This fixture handles six openings at a single setting of the work, the guides being very substantial and affording a long bearing for the boring tool.

Another operation on the same piece is shown in Fig. 7, which shows the angle between the two holes. It also shows the method of supporting the boring bar both at top and bottom as at *A* and *B*. It will be noted that the angle between the two holes is secured by



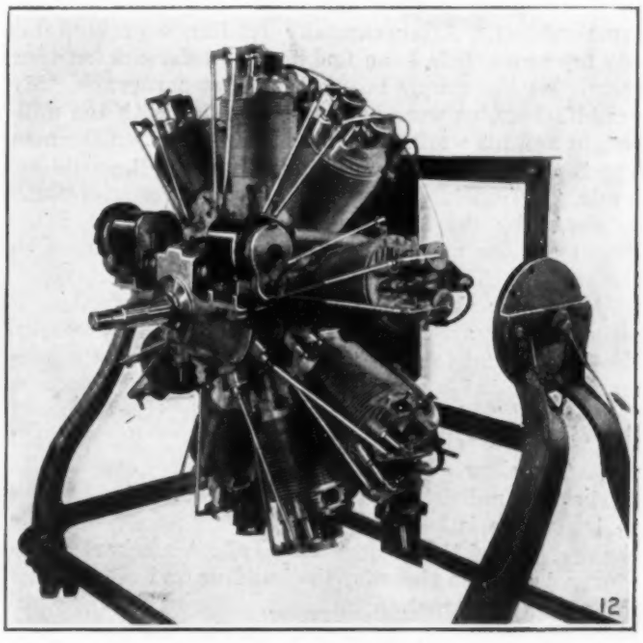


FIG. 11—ENGINE WITH COVER REMOVED. FIG. 12—COMPLETE MOTOR ON STAND

shifting the wedge-shaped base block *C*. Three other operations, also on aluminum parts, are shown in Figs. 8, 9 and 10.

In Fig. 8 the double valve-guide is being milled with the slots that hold the cam rollers in their proper position, as can be seen in Fig. 11. This single casting forms the guide for both the inlet- and exhaust-valve tappets of the same cylinder, the valve push-rods leading off at an angle as shown in the views of the assembled engine.

The same fixture is shown in both Figs. 9 and 10. One shows the side and top plate in position while the other shows simply a counter-boring operation. It will be noted in Fig. 10, that two top plates are provided as at *A* and *B* so that separate operations can be performed in the same fixture. The side plates control the holes shown in the pump body at the left of the fixture.

Two views of the motor on an assemblying stand are shown in Figs. 11 and 12. The first shows the front plate removed so as to expose the gearing, the cams and the cam rollers which actuate the valves. This view also shows the three carburetors, one being provided for each group of three cylinders. It will be noted that the three upper cylinders are connected to a small copper tube which makes it easy to prime them for starting. The type of assembling stand which has been found most satisfactory for these engines is also shown.

The completed engine with the two magnetos in place is shown in Fig. 12. It also shows the projecting end of the crank shaft with its splines for holding the propeller hub. There are 29 of these splines, the 30th position being left blank so as to insure the hub always going in the same position. Both views give a fairly good idea of the compactness of the Lawrance engine.

Discussing the Millwright

BY GEORGE WALTER

Harry Senior, from somewhere in New England, writing under the title of "The Millwright," on page 556, Vol. 58, of the *American Machinist*, seems to have taken exception to a previous article by myself upon the same subject. After carefully reading over both his any my own article I can find no real difference between them. He has simply misread my first paragraph. My grandfathers, as were his, were familiar with the millwright and his work. The millwright was then the man who built the mill, and in all probability still should be. I might refer Mr. Senior to Hobart's "Millwrighting," published by the McGraw-Hill Book Co., which I believe to be the most complete and thorough treatise on the subject. That author will bear us both out.

Mr. Senior should have noticed that the word millwright in my article was inclosed in quotation marks. By this I meant to show that a new sort of maintenance man had made his appearance in the shop, known as the "millwright." That he was not in the true sense of the word a real millwright was exactly the point I wished to show.

The true millwright is just what Mr. Senior says he is, but where is he today? What part does he play in the erection of the modern factory? A mechanical engineer draws the plans for the building and the contract is let to a construction company. The engineering department works up the layout, showing the exact location of each and every machine to be installed, the location of the shafting, the number of pulleys, belts and even the location of the work benches.

After the construction company has completed its work the millwright comes on the job and what does he find? Concrete foundations for the machinery, with bolts embedded in them to fit the bases of the machines to be installed. He finds channels overhead, often with the holes drilled to receive the countershafts. He finds that some electric company has completely installed the power plant. That one contracting company has taken care of the water system and another the wiring of the plant for its motors and lights. His work has been all cut and dried for him. He is simply a gang boss.

It is only natural that this millwright should want to find something which he might call a regular job. The most logical thing open seems to be maintenance and to this field he has turned, retaining his title. Today this man is essentially a maintenance man and I know many of them who would stand aghast if they were asked to get out plans for a new building. They would be helpless, and yet they are rated by their employers as good millwrights.

Yes, Mr. Senior, the new "millwright" decidedly belongs to the last decade. He could not, and would not, attempt to make a lineshaft out of oaken timbers 10 in. square or use wooden drums for pulleys, and I doubt if one out of a hundred of them would be able to build a waterwheel "from the ground up."

It may interest Mr. Senior to know that I have been conducted, as a guest, through two of the largest paper mills in the world. I have been employed in plants of some of the largest corporations in the world and in all parts of the world. I can describe to him the plants of England, France and Belgium, of Mexico and the Panama Canal zone, the coal mines of Pennsylvania and even the gin mills of the South.

And, Mr. Senior, I once worked in one of the largest sardine canneries of New England where there were conveyors which could have carried a locomotive with the same ease as they carried fish. True they did not call their maintenance man a "millwright," but he was there just the same and he was exactly the kind of a man I tried to describe in my article. He was paid a good wage and offered more when he resigned. I know, because I was he.

Automobile Designing

There are many ways of producing a motor car, more than one way of producing a cheap motor car, but few ways of producing a good motor car cheaply, according to *Automobile Engineer* (London). Even in the hurly-burly of keeping abreast of the contemporary design, a large staff is necessary to carry out drawing-office and experimental work, yet this shows no immediate improvement in the profit and loss account. If anything new be contemplated, such as magnetic brakes, supercharged engines or a novel transmission very many experimental sprats must be thrown to catch the production mackerel.

Modern mechanism is too complex to be evolved from the inner consciousness of any man, however brilliant. Neither does a new constructional method often arise by some flash of genius. Such things are built up step by step, with many false turnings and fresh starting points.

Automotive Service Methods and Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

Seventeenth article — Servicing transportation units for telephone "trouble shooters"—Replacing an axle bushing—Testing a generator—Some home made tools

WORK IN AN automotive service station is intermittent, and that foreman is wise who knows how to turn occasional lax hours to account by putting the unoccupied workman at the task of making tools for future use.

The equipment of the service plant of the Southwestern Bell Telephone Co., St. Louis, Mo., includes a number of efficient homemade tools. One of these tools

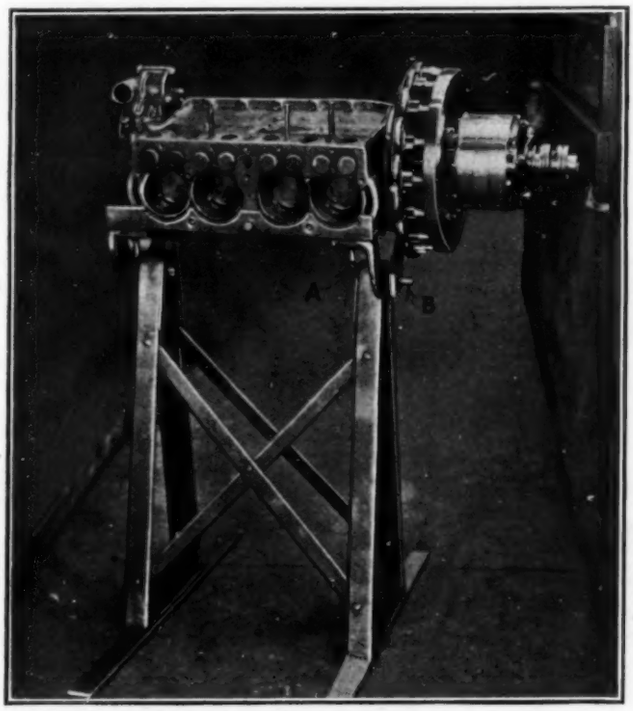


FIG. 1—A HOME-MADE MOTOR STAND

is the motor stand shown in Fig. 1, which is made of several lengths of 2 x 4-in. angle steel, supported by straps of bar iron, as shown. The cylinder block is held in place by cap screws screwed into the cylinder head bolt-holes on one side and the crankcase bolt-holes on the other side. The angle steel is cut away on one side so that the pistons can be fitted into the cylinders, as can be seen by reference to the illustration. The motor can be tilted sidewise to any desired angle and locked in position by means of the bolt *A*, which is threaded into the block *B*. Two of these bolts, one at each end, are sufficient.

It occasionally happens that the hole for the spindle-bolt bushing in a front axle becomes so badly worn that it has to be drilled larger and a new bushing put in. In this case the toolblock is removed from the lathe and the fixture shown in Fig. 2 is applied. The axle is clamped in the fixture and aligned by the lathe centers. After alignment, the headstock center is removed and a drill inserted. After the hole is drilled, the bushing is pressed in by placing a block between the bushing and the headstock and forcing the piece along by means of the tail center. The bushing is then line-reamed before the piece is removed from the fixture.

The illustration, Fig. 3, is that of a connecting-rod aligning fixture of simple, though efficient, design. A shaft is put through the large end of the rod and then clamped in the two V-blocks shown at the right end of the fixture. The small end of the rod, containing a piston pin, is brought to rest on the movable section of the fixture, as shown, and the section is clamped in place. By slipping a feeler gage under and behind each end of the piston pin, any twist or bend in the rod can be detected.

The bending clamp attached to the connecting rod, Fig. 4, makes it possible to apply pressure at any desired spot in the rod, and can also be used to straighten the rod without removing it from the crank case, if this should be desirable.

A tool for compressing valve springs so the cotter pin can be inserted or removed is an absolute necessity in a repair shop. Such a tool, made from a couple of

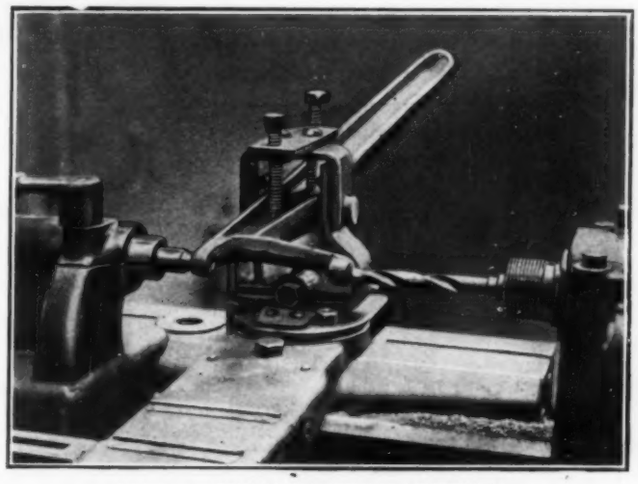


FIG. 2—DRILLING OUT A BUSHING

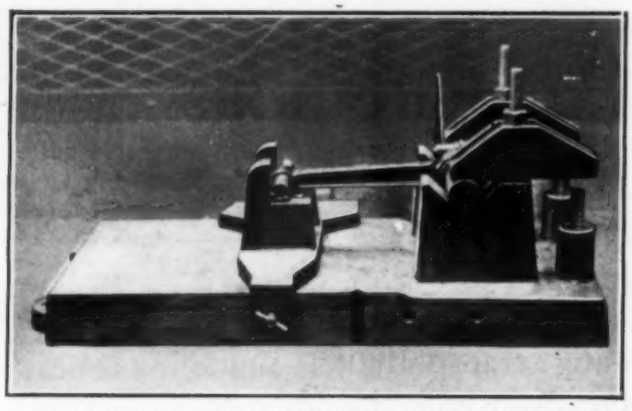


FIG. 3—STRAIGHTENING FIXTURE FOR CONNECTING RODS

odd pieces of bar iron and a spring, attached to a piece of 2 x 8-in. joist, is shown in Fig. 5. When pressure is applied to the handle, the piece *A* pushes the spring

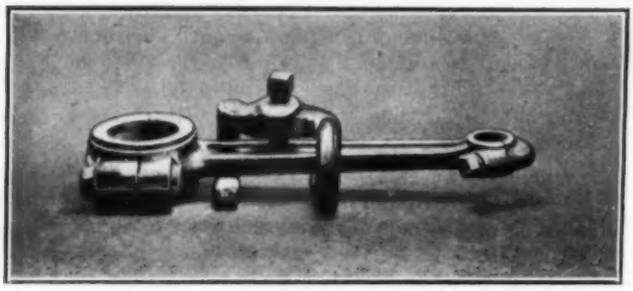


FIG. 4—APPLYING PRESSURE AT A SPECIFIC POINT

down so that the cotter pin can be removed. If the pin sticks so that it becomes necessary to use both hands to get it out, the handle can be held in position by supporting the rear end on a rivet in the hinged piece *B*, which can be swung to the desired position as shown.

It often becomes necessary to remove the spring from a valve while the motor is in the chassis, as shown in Fig. 6. Here a rod is bent to form a support for an old spring leaf which has a slot cut in the end, so that it can be slipped over the valve stem and thus used to raise the spring. This tool is as efficient as it is simple.

A generator is shown in Fig. 7 in position for testing. The generator is bolted to a section of bar iron that is in turn bolted in the tool rest of a Cisco lathe. The pinion on the generator shaft is meshed with a gear on a camshaft held between the lathe centers and the lathe is then run on the open belt. The generator is connected to a battery and ammeter just as it would be in actual service. By testing several generators that were known to be good and noting the amperage recorded, a standard was set

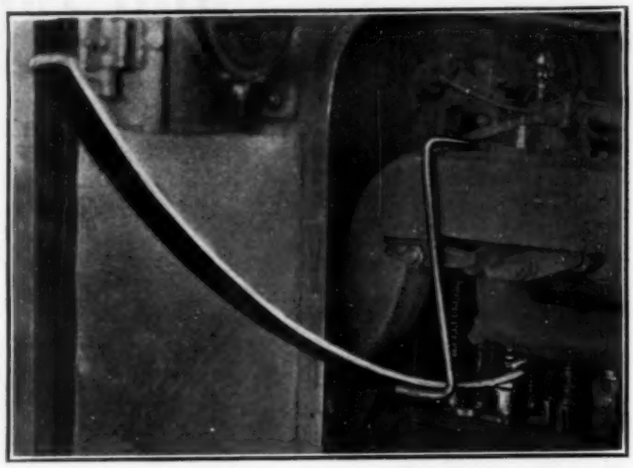


FIG. 6—ANOTHER VALVE SPRING COMPRESSOR

which all doubtful generators must reach before they are placed in service.

Honing a reamer is a delicate operation, and even the best mechanic does not always get a perfectly true edge on the reamer blade. The device shown in Fig. 8 makes it possible to turn out a better job of honing with less skill than is required if the job is done entirely by hand. The reamer is held between centers, as shown, and the blade to be honed is held to the desired position by a rest at the back of the machine that is adjusted for position by means of a knurled screw.

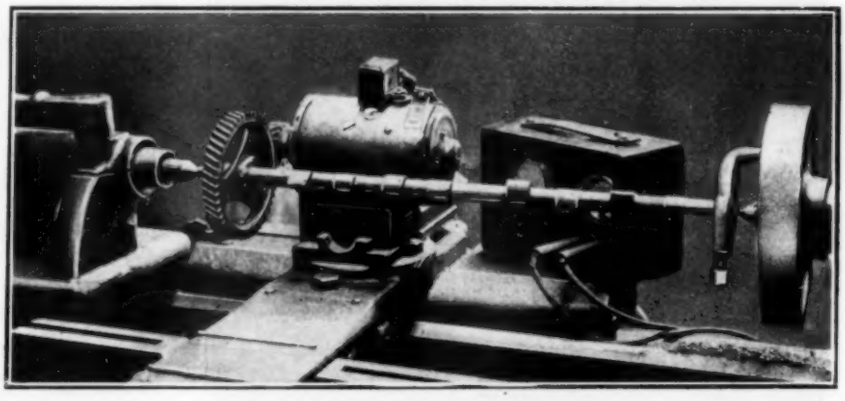


FIG. 7—TESTING A GENERATOR

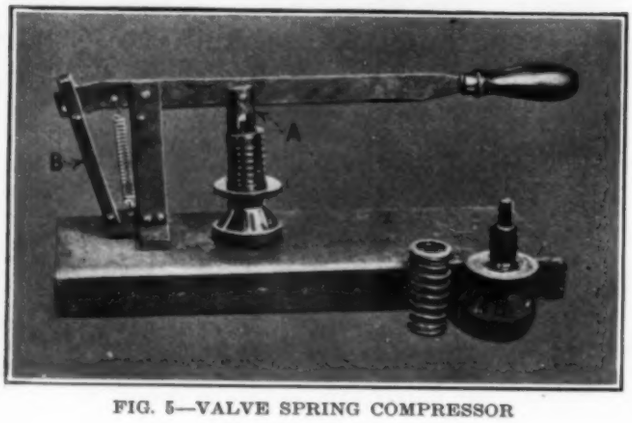


FIG. 5—VALVE SPRING COMPRESSOR

The hone is held in an aluminum frame cast solid with the handle, the handle being supported by an adjustable rest at the front of the machine. This device eliminates the possibility of tilting the hone, and insures honing the blade straight. The tool is marketed by the Gundlach Machine Works, Belleville, Mo.

A grinding-wheel guard which could be used to advantage in practically every machine shop is shown in Fig. 9. The guard consists of a section of celluloid cut to size from the window of some old automobile top and edged with a strip of leather, the whole being riveted to a short piece of flat iron as shown. The iron is bolted to another piece of the same material which is attached to a post, the bolt serving as a pivot so that the guard can be used over either wheel. The guard

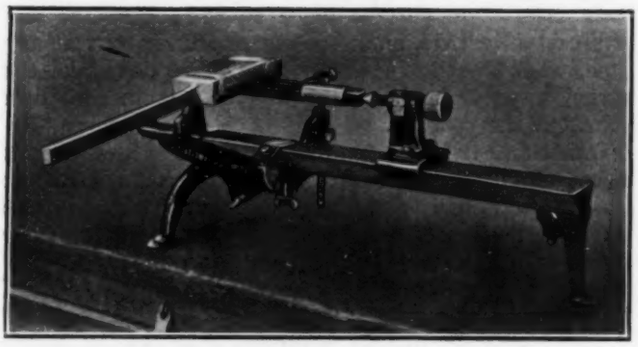


FIG. 8—A REAMER HONING FIXTURE

fully protects the eyes of the workman without requiring him to use goggles.

It so happens that drivers occasionally lose their keys, with the result that new ones have to be made. As a duplicate of the keys used for every transportation unit used by the company is kept in the machine-shop office, a new key can very easily be made by the aid of the

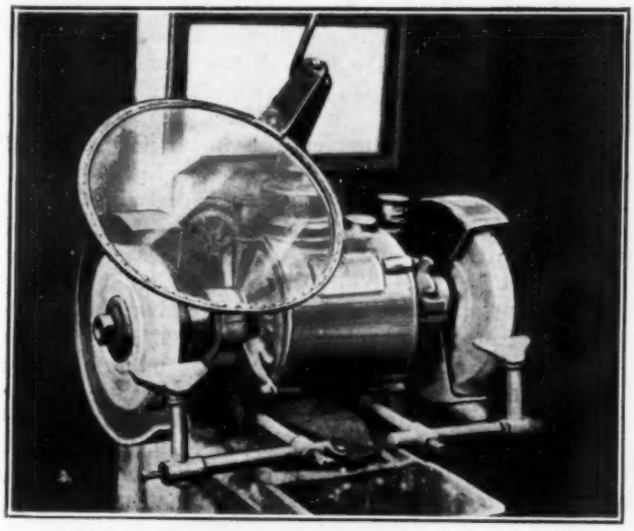


FIG. 9—AN EFFICIENT GRINDING WHEEL GUARD

machine shown in Fig. 10. The duplicate key is clamped in the machine at *A*, in a rest which both swings and slides on a shaft through the center of the machine. As the sample key is passed along over the sharp edge of the piece *B*, a thin milling cutter cuts corresponding indentations in the key blank shown at *C*.

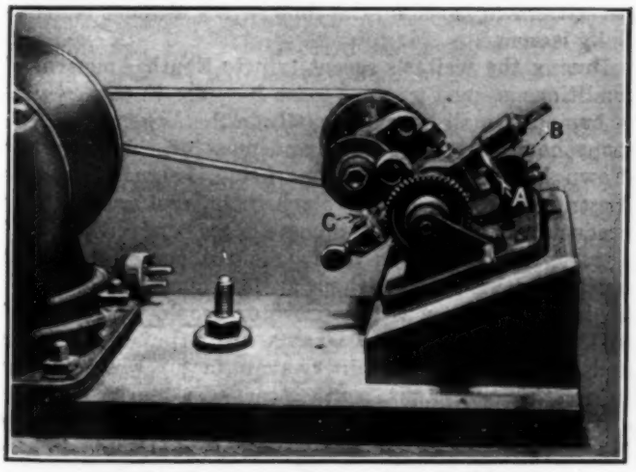


FIG. 10—MAKING DUPLICATE KEYS

Employment Management; a New Opportunity for Service

BY S. R. RECTANUS
Assistant Manager, Ashland Division,
The American Rolling Mill Co.

In days past, the hiring of men was done something after this fashion:

Foreman—"Hey, you!"

Four or five men started forward, but the one wanted was finally picked out.

Foreman—"You want work?"

Man—"Sure"

Foreman—"Billy, give this guy a check; I'll tell you his rate after I try him out."

Not many years ago our procedure was very simple. The foreman who was short of hands went to the gate, looked over the crowd, picked out the man he wanted and hired him. This hiring process was routine. The timekeeper's office was at the gate, and the chief timekeeper was always an interested witness of the ceremony. How different is the present-day point of view!

Practical men who spend their time in making and doing are liable to look at things from a very material viewpoint. Industry in its development has drawn together larger and larger associations of men and women who apply energy to matter to change things into a usable form.

We eat things, we wear things—we handle, see, feel, and accumulate things. Our very senses are arranged to let us easily recognize and appreciate material objects. Our histories, our laws, our ethics deal chiefly with the material rights of man. We even think of men and women themselves as objects.

Human slaves resisted until our own generation, and the desire for freedom is an ever present blessing, barely won from centuries of oppression and domination. Ignorance and lack of understanding, safeguarded by suspicion, fear the unknown search for enlightenment.

Accepting the economies of specialization of labor and larger scale production, there is gradually developing a conviction that men are honest by preference, that fair play gives as well as takes, that harmony of effort accomplishes more for all than discord. Modern industry is building for its use a new form of specialized service. Employment management is designed to help men help themselves and each other, striving to bring about a better understanding for, of, and by men.

Personality defies measurement. We have no standard man. Ambition, judgment, experience, leadership, inspiration are human elements which have not yet been isolated in the laboratory. Can fear, jealousy, hate, clumsiness, or suspicion be useful in a plan of co-operative service? Is devotion to the group more to be desired than individual progress?

Modern industry organized under competent human leadership has the opportunity to prove by practical accomplishment that service yields the greatest human dividends. The manager, the superintendent, the foreman guiding the efforts of workmen under sound human policies are the ultimately responsible individuals. They can use the help, the service of men and women who devote their interest to the development and perfection of understanding and encouragement and appreciation of human men and women who are working together with a common purpose.

Extract of a speech delivered at the National Conference of Business Paper Editors at Middletown, Ohio.

Selling Machinery in South America

By R. A. Colorado
Export Sales Dept., Clipper Belt Lacer Co.

THAT the natural resources of the countries south of the Rio-Grande compare favorably with our own is quite generally admitted but most of them are yet to be developed. This lack of development is equally true when one considers the progress that American manufacturers have made in providing a market for their goods in those countries.

Several causes have lead to this latter condition. Our country has been blessed with such wonderful resources and the manufacturers have been so busy developing them that they have had little time left to think of other countries beyond their borders. Again, our attitude toward foreigners has reacted against good feeling between these South American countries and our manufacturers. This attitude has led to certain prejudices which stand in the way to a better understanding. What is needed is a frank, open minded and manly attitude that will try to understand and measure things by the proper standard.

So much for generalities. What are the best markets in the South for American machinery? In the order named, Mexico, Brazil and the Argentine. In the future unquestionably Brazil and the Argentine will surpass all others. Mexico is at present, unfortunately, very much unsettled, and the limited resources of the west coast of South America, naturally limit the possible market there. Some business is done in Chile, Peru, Ecuador, Colombia and Bolivia; there are a few plants around the capital of Venezuela, but industrial growth seems more rapid in Brazil and the Argentine than anywhere else.

The industrial development of both Brazil and the Argentine has just begun. If our machinery manufacturers are alive to the fact, they will not miss the opportunity which these two countries present. It is the writer's sincere belief that they will develop into the two best foreign customers for our machinery in the future.

This brings up the question of getting a start in these markets. Three roads are open to the American manufacturer who wants to sell his wares in Brazil, the Argentine or any other market in South or Central America: the commission houses, the local jobbers in those countries and the manufacturer's export salesmen.

The Local Jobbers

That the commission houses are an effective element in the development of our export trade, no one will deny. They however have their limitations and it will not be necessary to enlarge on the topic. The local jobbers and representatives sometimes lack the agressiveness which is necessary to place a certain product on the market. In many instances their attention is divided among too many lines, and in other instances they are used to the easy business which comes of its own accord in those lines which are already well established and need no special effort. Especially in South American countries it is only too true that the majority of the commercial houses would rather do business in the staple commodities which everybody wants. There is also the feeling, whether warranted or not, on the part of a good many of these local dealers, that it is not to their interest to put too much effort back of the sale of a certain article, since the manufacturer may at any time, when the business has been developed, take the agency away from the local dealer or establish his own offices in the country.

Sometimes it becomes advisable to establish a branch office in a foreign country, when the nature of the product permits it and when the market is such as to warrant this step. I am speaking however of the early stages in the development of a certain line.

Manufacturer's Foreign Salesmen

This leaves the foreign salesman, if he has the proper equipment and is the right type of man, supreme as a developer of the foreign market. Here in the United States we are not satisfied to leave the line entirely in the hands of the local dealer and every factory has its own body of factory representatives. It stands to reason that such should also be the case in dealing with a foreign market. To the question that the maintenance of a body of foreign travelers is an expensive proposition, the answer can be made that such a body of salesmen naturally must be commensurate with the extent of the market and that it is not always necessary to keep such salesmen out in the field all the time. It is also possible to entrust a man with more than one article, provided the nature of such articles is more or less allied. Care should be exercised however not to spread a man's efforts so thinly that he becomes ineffective.

A word must be said concerning advertising in foreign countries. Usually, a manufacturer is contented with translating his domestic copy and inserting it in some export journal. While these domestic publications fill an important place in foreign advertising some effort should be made to adapt the domestic copy to the needs of the foreign market. American manufacturers have found American copy ineffective for use even in other English speaking countries. It need not be said that translated material is, to say the least, awkward. The translator is charged with the performance of a thankless, almost impossible task. No matter how able, he cannot deviate from the copy submitted to him which is in most cases almost valueless for use in a different country, where different customs prevail.

As an illustration, usually if a certain article is advertised in this country as a labor saving appliance, or a time saving specialty, we think that on this point alone a good number of sales should be made. But in South America where methods are of necessity crude and where labor and time are plentiful, the appeal of an advertisement based on the time saving element is materially lessened.

During the writer's recent trip to South America all conditions seemed to point to an increase in the activity of business in all lines, especially in the Argentine. The crops have been bounteous and most of the materials grown have found a fair market. Uruguay and the Argentine are beginning to sell their wool and packing products, grain and other home crops, and copper and nitrates began moving a few months ago in the west coast. Exchange conditions are of course still against us, but either they will improve or people will get used to them. Everything warrants an optimistic attitude and the American machinery manufacturer who wants to sell his wares in South American markets, if he approaches the problem with his mind made up to study it carefully and solve it rationally, should find in the southern markets a source of very profitable business.

Developing a Column Clamp For the Right Line Radial Drilling Machine

By W. T. SEARS

Steps and experiments in development—Constructions that were not satisfactory—Residual magnetism in drills Type of clamp finally adopted

IT HAS OCCURRED to the writer that a partial account of the development of the clamping mechanism of the Right Line radial drilling machine might make rather interesting reading, for we went through quite a wide range of experiment before settling upon the final construction. In the first place the design of the column of this machine called for a different type of clamp than is usual in radial drilling machines. That is, the clamping mechanism must act in a vertical direction in order to bring the wide supporting flange of the column against the upper flange of the pedestal. That the column must be clamped downwards and not sideways will be evident from the section shown in Fig. 1. The parts are all marked and anything except a general description is unnecessary. The column is supported when in its free or swinging position on flat steel springs which transmit the weight through the vertical shaft to the ball bearing at the bottom. The adjustment is such that there is a few thousandths of an inch clearance at the horizontal bearing flange when the column is released.

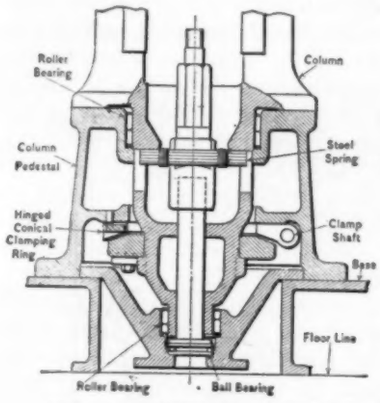


FIG. 1—CROSS-SECTION OF COLUMN TRUNNION

In operation, when the arm is properly positioned the conical clamping ring is contracted and acting between the conical surface that forms part of the column and a flat surface of the pedestal, forces the column down to its flanged bearing and locks it firmly in place. The first machine had a hand operated clamp which worked satisfactorily and was easy to operate but in order to relieve the operator of all the work possible it was thought best to develop a clamp which could be controlled with ease from the operator's position at the head. This machine being strictly an electrically driven machine, that is being built to get all the benefits possible from electric drive without having modifications necessary to make it convertible to belt drive, we thought the clamping mechanism should, if possible, also be electrically controlled. The clamping movement required is very slight even though the pressure required is heavy and on this account, as well as from a cost point of view, the first experiments were conducted with solenoids. The construction of the clamp of one of the earlier types we experimentd with is shown in Fig. 2.

This construction did not work out in practice as we hoped, although even yet we are not certain that it does not have some possibilities. The friction of the parts was high, the solenoid required larger than first expected, the spring of the clamping parts more than anticipated and the adjustments were not easy to make. That is, they were not easy to make and make right and be simple and cheap in construction. Owing to the fact that the lift was entirely on the front or drill side of the machine there seemed to be a probability that if we could take care of the front edge and clamp it firmly there would not be enough play or clearance at the rear to do any harm. In any event, as far as the experimental part of it was concerned, if we could satisfactorily clamp the front and found that a clamp in the rear was necessary as well it would be a simple matter of duplication. In Fig. 2, *A* is a solenoid connected through link *B* to crank *C*, crank *C* being in turn keyed to the shaft *D*, which was made as an eccentric in the center and on which was hung the clamping link *E*. The spring

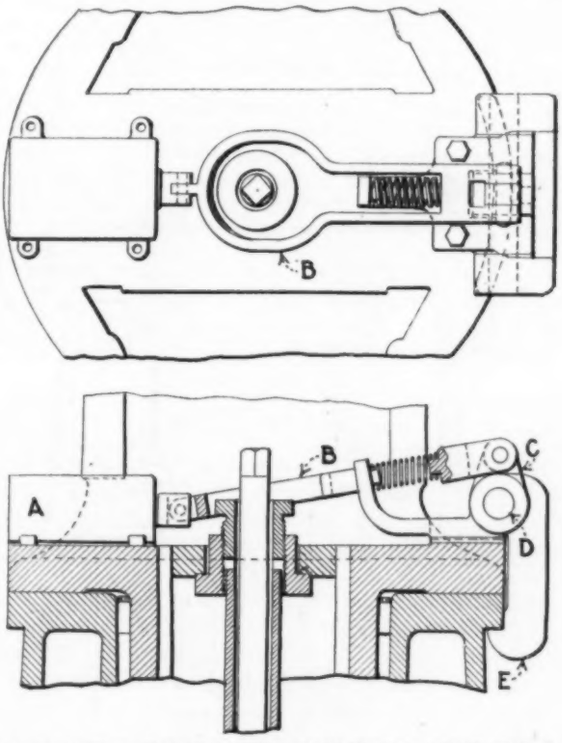


FIG. 2—FIRST EXPERIMENT (SOLENOID OPERATED)

shown was to return the parts to the released position. With the toggle action of the eccentric and link and the increased pull of the solenoid at the end of its stroke we expected to have ample power for clamping.

In Fig. 3 is shown another modification of the solenoid construction in which the upper flange of the pedestal was made on a taper and the clamping obtained by an endwise wedging action of the part *A*, *B* being the solenoid, *C* an adjustable link, the inner end of which exerted a pull on the pin *D*, the lever acting around the fulcrum pin *E*. The actual details were not exactly as shown but the sketch shows the general principle. During this experimental work we ran across the possibility of making the solenoid larger and a part of the machine itself and doing away with all moving levers. This was a rather radical departure but some preliminary experiments satisfied us that we could get holding power enough and get it at a not too high cost of current consumption, and this was important, as the clamping action had to be on all the time the machine was working. With the solenoid working through levers this need not have been necessary, although some small current had to be kept on in the design shown.

In Fig. 4 is shown the construction of this built-in type. The cost, however, for the coil was rather high, although due to its simplicity the cost would not have been prohibitive if it had been satisfactory in all other ways. It developed some rather interesting but possibly objectionable features. The main one was that it magnetized the whole machine to some extent and there was a probability that this magnetism would attract metallic particles to working surfaces where they would be decidedly objectionable. Another possible bad feature was that it even magnetized the drill. When the drill was backed out of the hole it brought a large majority of the chips with it, especially fine chips, which were usually rather hard for the operator to get rid of. If this had been the only action of the solenoid we might have considered its adoption, because it was thought by some of the operators of the machine to be quite advantageous. For instance, in spotting the hole to start with, the drill would be fed down a short distance and then when lifted it took the small chips with it and left the conical start of the hole all clear for the operator to see its location as regards marks. It was also good, as before stated, to lift the fine chips and dirt from the shallow holes, but there was also some objection in that the chips clung to the drill and were sometimes rather hard to remove, as the drill kept its magnetism to some extent even after the current was cut off from the solenoid.

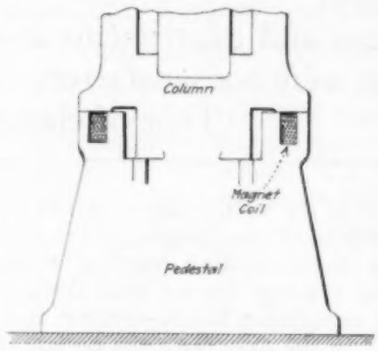


FIG. 4—CONSTRUCTION OF BUILT-IN TYPE OF SOLENOID

The next trial was with small motors and the construction became somewhat similar in appearance to that now on the machine. The hand-clamp screw was extended through to the other side, the hand clamp being left undisturbed, and the motor connected to the other end of the nut or screw.

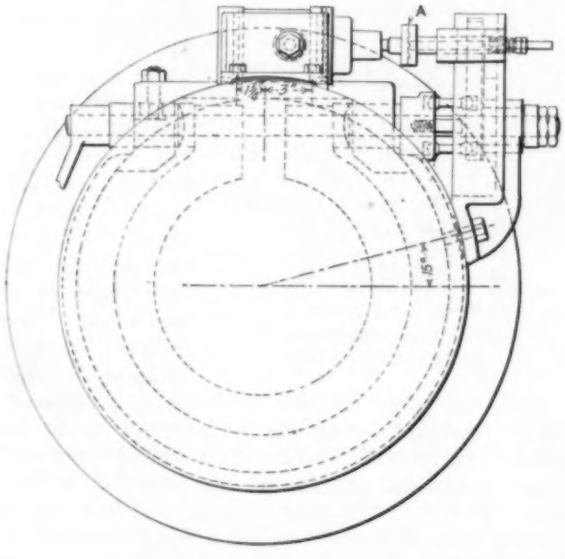


FIG. 5—CLAMP OPERATED BY MOTOR AND CLUTCH

The question of torque was the main point to be settled here and several methods were tried. The first one consisted of a clutch having V-shaped teeth and backed up by a spring as shown at *A*, Fig. 5. This was all right as far as the actual action was concerned, but

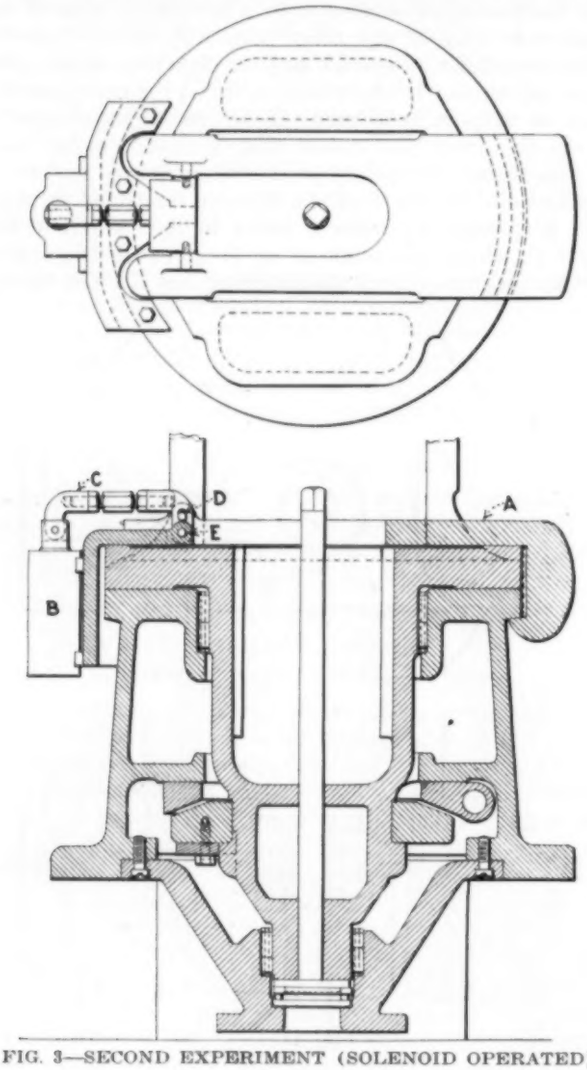


FIG. 3—SECOND EXPERIMENT (SOLENOID OPERATED)

the noise when it went into operation was decidedly objectionable and it did not seem as though the construction was one that could possibly give good wear. Designs were made for different arrangements to keep the teeth apart after they were disengaged and to allow them to go in when the motion was reversed. It meant more or less of an increase in the number of moving

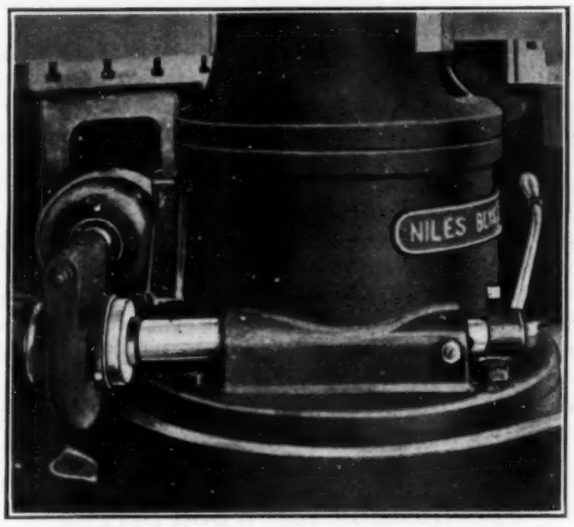


FIG. 6—CLAMP FINALLY ADOPTED

parts and a corresponding tendency to get out of order, and as simplicity was the keynote of the machine, they were all finally abandoned.

The next tests were with a motor giving a definite torque and so arranged that it could be stalled without injury to either the mechanical or electrical parts. We arranged to have it stop in both directions against a gradually increasing resistance. When reversed it started with practically no load and there was therefore no danger of its becoming stuck in a stalled position. This type of clamp with minor modifications was finally adopted and is shown in Fig. 6.

There is, of course, nothing especially startling in the above investigation and series of experiments but they show how a problem having certain limiting conditions was satisfactorily solved and the trouble and expense that the average builder of machine tools often goes through in the development of what may be a comparatively simple device when finally completed.

Foundry and Machine Shop Products, 1921

THE Department of Commerce announces that reports made to the Bureau of the Census by the boiler shops, foundries, and machine shops show products manufactured to the value of $1,565,527,000 in 1921, as compared with $2,289,251,000 in 1919 and $866,545,000 in 1914—a decrease of 32 per cent from 1919 to 1921, but an increase of 81 per cent for the seven-year period, 1914 to 1921.

This industry classification is not to be construed as covering all establishments using foundry and machine-shop processes. Many establishments assigned to other industry classifications employ these processes to a greater or less extent in the manufacture of their finished products, as for example:—Machine tools; textile machinery; electrical apparatus, machinery and supplies; locomotives; engines; automobiles; agricultural implements; stoves and furnaces; cast-iron pipe; etc. However, there are foundries and machine shops making a variety of products which cannot be clearly segregated and assigned to any specific industry class, and these have been included in a broad group designated as "Foundry and machine-shop products."

A press notice recently issued relative to machinery manufactured in 1921 covered the various kinds of machinery, including machine parts and castings, reported by the establishments classified in the "Foundry and machine-shop products" industry, and also by those assigned to other industry classifications.

Irregularities in Employment

There was considerable fluctuation in the monthly employment of wage earners in this industry during 1921. In January, the month of maximum employment, 384,084 wage earners were reported, and in October, the month of minimum employment, 291,712—the minimum representing 76 per cent of the maximum. The average number employed during the year was 321,363 as compared with 482,767 in 1919 and 362,471 in 1914.

The statistics for 1921, 1919, and 1914 are summarized in the following statement; the figures for 1921 are preliminary and subject to such change and correction as may be found necessary from a further examination of the original reports:

	1921*	1919*	1914*
Number of establishments	9,013	10,934	10,640
Persons engaged	397,605	577,308	429,072
Proprietors and firm members	6,789	7,662	7,923
Salaried employees	69,453	86,879	58,678
Wage earners (average number)	321,363	482,767	362,471
Salaries and wages	$585,054,000	$804,346,000	$328,550,000
Salaries	172,695,000	181,775,000	84,404,000
Wages	412,359,000	622,571,000	244,146,000
Paid for contract work	7,620,000	6,722,000	2,666,000
Cost of materials	653,364,000	948,070,000	358,122,000
Value of products	1,565,527,000	2,289,251,000	866,545,000
Value added by manufacture†	912,163,000	1,341,181,000	508,423,000

*Statistics for establishments with products valued at less than $5,000 are not included in the figures for 1921. There were 1,560 establishments of this class reporting an average of 1,063 wage earners and products valued at $4,028,000. For 1919, however, data for 1,611 establishments of this class, reporting 1,066 wage earners and products value at $4,344,000, and for 1914, data for 2,610 such establishments, with 3,248 wage earners and products to the value of $6,843,000 are included in all items with the exception of "number of establishments."

†Value of products less cost of materials.

Pool Car Shipments

Pool car shipments, if properly handled, will help to relieve credit tension, increase turn-over, lessen transportation cost and aid production and sales, as well as relieve our transportation facilities of a vast amount of freight handling and terminal congestion, according to Lee Cotter, in an address delivered at the eleventh annual meeting of the United States Chamber of Commerce. It goes without saying that if we accomplish even a small result in each of these directions, the cost of distribution will be materially reduced and there is also to be considered the advantages of transferring idle cars from one line to another.

Uses for the Cutting Torch

By William J. Fisher, Jr.

On page 224, Vol. 58, of the *American Machinist*, there was described an interesting welding job on foundation bolts, that was explained by E. R. Norris to the American Welding Society.

Recently we had a job changing our high pressure steam pipe, which was supported on brackets on the outside of the building, about 20 ft. from the ground. This job had to be done at the week-end, and our time was therefore limited.

Each flange contained sixteen ¾-in. bolts which were rusted fast, and taking them off with wrenches was out of the question. We then got out our acetylene torch and used the large tip which we employ for cutting cast iron. We set the tanks on the ground, and passed the torch up to the man, who walked out on the pipe, burned the bolt heads off and knocked the bolts out, completing each joint in about 10 to 15 minutes.

Two weeks before, we had to replace a coal conveyor in the basement of our boiler house; and as each section was about 33 ft. long, bolted and riveted together, and could not be disconnected easily, we used our torch to cut the conveyor apart, into 10-ft. lengths. We completed our job well within the time limit.

We use the small size tip on lead burning, and find it much superior to the old method in every way. We use the No. 6 tip on iron or steel burning, and the No. 1 for lead burning.

Hardening Tool Steel Parts

The oxyacetylene process has an important field of usefulness in the heat treatment of small steel parts. This is true particularly in the oil tempering of high-grade tool steel members for use as working parts and bearing surfaces in light machinery. These parts demand a temper to resist wear and thus forestall the necessity of replacement; the life and utility of the machine sometimes depending upon the service given by a very few important small parts.

The first step in heat treating, of course, is the heating of the part to be tempered. For this work the high temperature of the oxyacetylene flame renders it particularly adaptable. This flame, which produces the highest degree of heat obtainable by gas combustion, assures speed in heating, and makes possible the localizing of the heat effect which many times is desirable.

The ease with which the oxyacetylene flame may be controlled is also a factor in making possible local heating, as the heat may be applied directly and solely to the portion of the member it is desired to heat. Very small and irregular parts may be heated evenly throughout, thus assuring an even temper when the part is quenched.

The portability of a welding outfit may also be an asset in this work because it is especially adaptable in plants where the tempering of small parts is being done in more than one department. It is not necessary to maintain a separate department for this work, nor to equip different departments with the necessary apparatus to do their own tempering. One portable welding outfit may easily suffice; this being moved from one department to another as the demand for tempered parts arises in various sections of the plant.

The ease with which the oxyacetylene welding flame is handled makes it possible to heat the parts for tempering close to the point where they are to be quenched. This prevents the partial cooling of the parts in the air before they are quenched in the oil.

The operator doing the tempering takes a position before a supply of the pieces to be tempered, his welding torch in his right hand and a pair of tongs in his left. At the left of the supply of parts is the container of oil in which the heated parts are quenched. A part is grasped in the tongs, heated to a bright cherry red with the welding flame, and then, without changing his position the operator reaches over and plunges the heated part into the oil.

When a part of the member is to be tempered, only the section to be hardened is brought up to the cherry color. The torch is so manipulated, however, that the whole part is heated to some degree, so there will be no sharp division between the tempered and the untempered portions of the member.

So many small parts are tempered, and the advantages of the oxyacetylene process for some classes of this work are so great that this operation should prove an important addition to the great number of production heating processes served by the oxyacetylene blowpipe. —From *Oxy-Acetylene Tips*.

Specification for Wood Screws

The results of the standardization of wood screws by the manufacturers in co-operation with the Bureau of Standards and the technical committee on builders' hardware of the Federal Specifications Board have been summarized and officially adapted by the latter board for the use of all departments and independent establishments of the government in the purchase of wood screws.

The former difference of 0.013165 in. in diameter, used as a basis for the arithmetical progression of the numbering system, has been discarded in favor of a difference of 0.013 in. (even) as established by the National Screw Thread Commission for machine screws. This provides interchangeability for the numbered sizes of machine screws and wood screws, in connection with articles that may be fastened either to metal or wood.

Flat-, round- and oval-head types are covered in the specification. The numbered sizes of wood screws run consecutively from No. 0 (0.060 in., or 1.5 mm.) to No. 24 (0.372 in., or 9.4 mm.), omitting Nos. 13, 15, 17, 19, 21, 22 and 23. The diameter is measured on the body of the screw under the head, the maximum tolerance in diameter permitted being plus 0.004 and minus 0.007 in., or plus 0.1 and minus 0.2 millimeter.

The length of all screws is measured from the largest diameter of bearing surface of the head to the extreme end of the point measured parallel to axis of screw. Plus tolerance in length is always zero. Tables of minus tolerance in length are given. Screws are to be threaded approximately two-thirds of the nominal length. The included angle of the head on flat and oval head screws is 82 deg. The number of sizes of brass and steel screws manufactured as standard have been reduced from 555 to 291, a reduction of 47 per cent.

The complete report describing the specification and giving the tables of the standard steel and brass wood screws may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., for 5 cents.

Abstract of circular of the Bureau of Standards, No. 140.

Friction Clutch Data

By G. W. DRAKE

Methods of finding capacity, tractive force and efficiency of many types of clutches used for different purposes and operating at various speeds and under diverse conditions

CAPACITIES for slow speed friction clutches in different terms, such as turning force, turning moment, etc., also the closing pressures required, are given in Table I. The capacities are for clutches of the dry type, running under normal conditions.

The following assumptions have been made:

Face, or width of clutch one inch, unit tractive force, $K = 50$ lb., and co-efficient of friction $f = 0.15$.

When the clutch is to run at high speed or the conditions are unusually severe, the capacities given in Table I are to be modified. Modifying factors for the different conditions under which clutches may be run, are given in the other tables, which, together with the following data, should be carefully studied.

Table II gives the maximum unit tractive force K for friction clutches when run under different conditions, also corresponding modifying factors. The capacities given in Table I, multiplied by the modifying factor thus found, give the required capacities for the given conditions. By the term high speed, in Table I, is understood a speed up to, but not exceeding 500 r.p.m., this being high speed for the dry type of clutch under consideration. For the higher speeds obtainable with the wet type of clutch see Table V.

The handbooks contain very little data regarding the capacities of high-speed clutches and none regarding the difference in pick-up capacity when engaged gradually or suddenly. In some of the handbooks and clutch catalogs, hp. rating tables are given for different diameter clutches at 100 revolutions per minute.

Some tables give the torque in foot-pounds with a foot note, as follows: hp. $= 0.00019 \times$ torque $\times$ r.p.m., the assumption being that the torque remains constant at all speeds, and therefore the hp. varies directly as the speed. This assumption, however, is not correct, it having been found for speeds above 250 to 300 r.p.m., that the torque decreases as the speed increases. The reason for this is the increased difficulty in picking up the load at the higher speeds, the inertia or pick-up load, increasing as the square of the speed. For example, at 1,000 r.p.m. the inertia load would be four times as great as at 500 r.p.m. or twenty-five times as great as at 200 revolutions per minute.

Another reason is that the co-efficient of sliding friction decreases as the speed increases, making it necessary to adjust the clutch tighter for the high speeds if the torque is to remain constant.

On account of the greatly increased inertia load, however, it will not do to adjust the clutch tighter, because the strain set up would cause breakage. If not adjusted

TABLE I—DATA FOR FRICTION CLUTCHES: CONE, RING OR MULTIPLE-DISK TYPES

Giving capacities of friction clutches from 3-in. to 18-in. diameter with 1-in. face, at slow speeds, with variable loads: Assuming $f = 0.15$ and unit tractive force $K = 50$ pounds

Mean Diam. D	Friction Surface Sq.In.	Turning Force M At Mean Radius	Turning Moment Mt	Hp. Developed At 100 r.p.m.	Closing Pressures P for different cone-clutch angles. 10-deg.	12-deg.	14-deg.	16-deg.	18-deg.	20-deg.	90-deg
3	9.42	471.2	706	1.10	546	650	758	862	970	1,074	3,141
3½	10.21	510	829	1.30	592	704	821	934	1,051	1,163	3,403
3¾	10.99	549	962	1.51	637	758	885	1,005	1,132	1,253	3,664
3¾	11.78	589	1,104	1.74	683	812	948	1,077	1,213	1,342	3,926
4	12.56	628	1,256	2.00	728	867	1,011	1,149	1,294	1,432	4,188
4¼	13.35	667	1,418	2.23	775	921	1,074	1,221	1,375	1,522	4,450
4½	14.13	706	1,590	2.50	819	975	1,137	1,293	1,456	1,611	4,712
4¾	14.92	746	1,772	2.81	865	1,029	1,201	1,365	1,536	1,701	4,974
5	15.70	785	1,963	3.09	910	1,083	1,264	1,437	1,617	1,790	5,236
5¼	16.49	824	2,164	3.43	956	1,137	1,327	1,509	1,69E	1,880	5,497
5½	17.27	863	2,377	3.74	1,002	1,192	1,390	1,581	1,779	1,969	5,759
5¾	18.06	903	2,596	4.11	1,047	1,246	1,454	1,652	1,860	2,169	6,021
6	18.84	942	2,827	4.45	1,093	1,300	1,517	1,724	1,941	2,148	6,282
6¼	19.63	981	3,067	4.86	1,138	1,354	1,580	1,796	2,022	2,238	6,544
6½	20.42	1,021	3,318	5.22	1,184	1,409	1,643	1,868	2,103	2,327	6,806
6¾	21.20	1,060	3,578	5.67	1,229	1,463	1,707	1,940	2,184	2,417	7,068
7	21.99	1,099	3,848	6.06	1,275	1,517	1,770	2,012	2,264	2,506	7,330
7¼	23.56	1,178	4,417	6.96	1,366	1,625	1,896	2,155	2,426	2,685	7,853
8	25.13	1,256	5,026	7.88	1,457	1,734	2,023	2,299	2,588	2,865	8,377
8½	26.70	1,335	5,674	8.92	1,548	1,842	2,149	2,443	2,750	3,044	8,901
9	28.27	1,413	6,361	10.00	1,639	1,950	2,276	2,587	2,912	3,223	9,424
9½	29.84	1,492	7,087	11.24	1,730	2,059	2,402	2,730	3,073	3,402	9,948
10	31.41	1,570	7,854	12.36	1,820	2,167	2,529	2,874	3,235	3,581	10,472
11	34.55	1,727	9,508	14.96	2,004	2,384	2,781	3,161	3,559	3,939	11,518
12	37.69	1,884	11,309	12.82	2,186	2,601	3,034	3,449	3,882	4,297	12,566
14	43.98	2,199	15,392	24.24	2,550	3,034	3,540	4,024	4,530	4,913	14,560
16	50.26	2,513	20,105	31.52	2,915	3,468	4,046	4,599	5,177	5,730	16,754
18	56.54	2,827	25,446	40.00	3,279	3,901	4,552	5,174	5,824	6,446	18,849

The values in Table I are for clutches with dry or slightly greasy metal-to-metal friction surfaces, with steady load at high speed, or variable load at slow speed: The pick-up-load, or load at time of engagement assumed to be the inertia load only.

DIRECTIONS FOR USE OF TABLE

Multiply the values in table by the number of inches in face of required clutch, if 2-in. face, multiply by 2, etc.

Modifying factors will be found in accompanying tables. For other conditions and types of clutches the above values are to be multiplied by these factors.

In the first column the term mean diameter applies only to the cone and disk type clutch. For the ring type clutch the diameters given in the first column are the friction-surface diameters.

The closing pressure P for the ring or disk type of clutch is the same as for the 90-degree cone-clutch, see values in last column to the right. For the disk clutch, the values for closing pressure should be divided by the total number of disks, less one: or by the number of friction surfaces.

To find capacities for any diameter clutch by use of table, proceed by the rules of proportion, noting that the turning force M and the closing pressure P vary directly as the diameter and that the turning moment Mt and the hp. vary directly as the square of the diameter. For example: to find the hp. for a 36-in. clutch, note in table that the hp. for an 18-in. clutch equals 40, then by proportion $18^2 : 36^2 : 40$ hp. $:$ 160 hp.

tighter there would be excessive slippage, and the clutch would refuse to pick up the same load as at slow speed. To keep the strain and slippage within practical limits, the allowable load has to be determined for the different types of clutches at different speeds. This has been done to some extent, as several clutch manufacturers give in their catalogs hp. rating-tables for different speeds; in one case as high as 3,000 r.p.m., this being for a 5-in. multiple-disk clutch. The hp. rating given being the same at 100 r.p.m. as at 3,000 r.p.m., showing a drop of 96⅞ per cent in the torque. This is an extreme case, however. It should be noted here that this clutch is of the mutliple-disk type, having six driving disks, thus being six times as efficient as a single-disk clutch would be. Table IV gives capacities and efficiency ratings for the above 5-in. multiple-disk clutch at different speeds. The disks are of cast iron and bronze up to 1,500 r.p.m. and of steel and bronze for the higher speeds. Oil is used on the disks but they do not run in a bath of oil.

TABLE II—FRICTION CLUTCH DATA

Giving the maximum allowable unit tractive-force K for different kinds of service, with modifying factors.

For clutches with metal-to-metal friction-surfaces, slightly greasy and with frequent engagement, unless otherwise specified.

	K	Factors
Feed and speed change service		
Light starting load, variable running load		
Speeds up to 300 r.p.m.	50 lb.	1.00
Speeds up to 600 r.p.m.	33 lb.	0.66
Speeds up to 1,000 r.p.m.	25 lb.	0.50
Machine tool service		
Such as milling, drilling or turning machines		
Light starting load, and variable running load		
Speeds up to 300 r.p.m.	50 lb.	1.00
Speeds up to 600 r.p.m.	33 lb.	0.66
Speeds up to 1,000 r.p.m.	25 lb.	0.50
Machine tool service		
Such as turret lathes, tapping or threading machines		
Suddenly applied light starting load, reversed very frequently		
Speeds up to 300 r.p.m.	25 lb.	0.50
Speeds up to 600 r.p.m.	16 lb.	0.33
Speeds up to 1,000 r.p.m.	12½ lb.	0.25
Heavy machine tool service		
Such as punching, shaping or slotting machines		
High starting load, quickly accelerated, with variable running load		
Speeds up to 300 r.p.m.	8 lb.	0.16
Speeds up to 600 r.p.m.	6 lb.	0.12
Speeds up to 1,000 r.p.m.	.....	....
High speed machine tool service		
Such as wood working machinery		
Gradually applied light starting load variable running load		
Speeds up to 600 r.p.m.	33 lb.	0.66
Speeds up to 1,000 r.p.m.	25 lb.	0.50
Speeds up to 1,600 r.p.m.	10 lb.	0.20
Line shaft service		
Variable load, light service	50 lb.	1.00
Variable load, severe service	25 lb.	0.50
Hoisting or elevator service		
Heavy starting load, quickly accelerated		
Low speed	12 lb.	0.25
High speed	6 lb.	0.12
Automobile service		
Light starting load, quickly accelerated. Variable running load severe service.		
Leather-faced cone clutches		
Velocities up to 1,800 ft. per min.	4½ lb.	0.09
Velocities up to 5,000 ft. per min.	2¼ lb.	0.045
Asbestos fabric faced disk-clutches		
Velocities up to 800 ft. per min.	3 lb.	0.06
Velocities up to 3,600 ft. per min.	1⅛ lb.	0.024

Note: For more complete data see Tables VII and VIII.

TABLE III—CONE CLUTCH DATA

Ratio of closing force p, to turning force, M. Co-efficient of friction $f = 0.15$

Angle θ deg.	10 deg.	12 deg.	13 deg.	14 deg.	16 deg.	18 deg.	20 deg.
Ratio 0.93	1.16	1.38	1.50	1.61	1.83	2.06	2.28

TABLE IV—HORSE-POWER AND EFFICIENCY RATING FOR 5-IN. MULTIPLE DISK CLUTCH

Six driving disks, metal-to-metal, lubricated

R.p.m.	100	200	300	500	700	1,000	1,500	2,000	2,500	3,000
Hp.	12	18	21	23	24	21	18	15	13.5	12
Efficiency, %	100	75	58	45	29	17½	10	6¼	4.4	3.3

Table V gives efficiency ratings for high speed clutches operating under normal conditions and engaged gradually. The capacities given have been determined after a careful study of all tables and data available and are for clutches of the wet type, that is, clutches where the friction surfaces are well lubricated or bathed in oil.

Clutches suddenly engaged are much less efficient than when gradually engaged, the pick-up load being usually from 30 to 50 per cent less. For example: In the case of a 6-in. friction clutch, of the expanding-ring type, with clutch surfaces bathed in oil running at 212 r.p.m., it was found that the maximum pick-up load was 155 lb. when gradually engaged and 109.5 lb. when suddenly engaged, or a drop in efficiency of about 30 per cent.

TABLE V—EFFICIENCY RATING FOR FRICTION CLUTCHES WHEN GRADUALLY AND FREQUENTLY ENGAGED, OPERATING UNDER NORMAL CONDITIONS

R.p.m.	200	300	400	500	600	800	1,000	1,200	1,500	2,000	3,000
Efficiency, %	100	93	84	76	70	58	48	38	27	13	3

TABLE VI—EFFICIENCY RATING FOR FRICTION CLUTCHES WHEN SUDDENLY AND FREQUENTLY ENGAGED, OPERATING UNDER NORMAL CONDITIONS

R.p.m.	100	200	300	400	500	600	800	1,000	1,200	1,500	2,000	3,000
Efficiency, %	100	75	60	50	42	37	30	24	18	12	6	2

Note: The load a friction clutch will safely transmit when suddenly engaged, depends largely upon the suddenness of the engagement, and can only be determined with any degree of accuracy, by experiment. The above rating is based on very sudden engagement, such as obtained with a magnetic closing mechanism. The ratings as given in Tables V and VI may be considered as extreme cases. For the great majority of conditions a rating somewhere between these extremes should be taken.

Table VI gives efficiency ratings for friction clutches suddenly engaged. These ratings are recommended by a leading clutch manufacturer, as providing a margin of safety. In this table the rating for a speed of 200 r.p.m. is given as 75 per cent or a drop in efficiency of 25 per cent, which corresponds very closely with the drop in efficiency of the 6-in. clutch noted, which was 30 per cent.

The dry type of clutch as a rule should never be engaged suddenly unless the speed is slow or the unit pressure on clutch surfaces very low. The type of clutch having wood friction-blocks, such as the Dodge, Hill and others, should be thrown in gradually and allowed to pick up the load in an easy manner. At high speed this type of clutch can be adjusted so as to pick up a heavy load but when too frequently engaged or when suddenly engaged, the friction surfaces wear rapidly on account of excessive slip and if the clutch picks up the load without slip, breakage may be expected.

Tables VII, VIII and IX were compiled from data found in Leutwiler's "Elements of Machine Design." Tables VII and VIII being for motor-car clutches and Table IX for transmission clutches. These tables are

TABLE VII—MOTOR CAR CLUTCHES

Data compiled from Leutwiler's "Elements of Machine Design"
Leather-faced cone clutches

Velocity: Ft. per Min....	1,800	2,000	2,500	3,000	3,500	4,000	4,500	5,000
K	4.50	4.00	3.20	2.75	2.62	2.50	2.38	2.26
Efficiency, %...	100	88	71	61	58	55	53	50
p'	22.5	20.	16.	13.87	13.10	12.50	11.90	11.30
f	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20

K = Unit tractive force = $p'xf$
p' = Unit normal pressure
f = Co-efficient of friction

TABLE VIII—MOTOR CAR CLUTCHES

Data compiled from Leutwiler's "Elements of Machine Design"
Asbestos-fabric faced disk clutches

Velocity, Ft. per Min.	800	1,000	1,500	2,000	2,500	3,000	3,500	3,600
K	3	2.86	2.54	2.22	1.90	1.58	1.26	1.20
Efficiency, %	100	95	85	74	63	53	42	40
p'	15	14.76	14.27	13.70	13.16	12.63	12.10	12
f	0.20	0.192	0.178	0.162	0.145	0.125	0.104	0.10

K = Unit tractive force = $p'xf$
p' = Unit normal pressure
f = Co-efficient of friction

TABLE IX—TRANSMISSION CLUTCHES

Data compiled from Leutwiler's "Elements of Machine Design." Clutches with cast-iron disks faced with compressed paper

Velocity, Ft. per Min....	100	200	300	400	500	600	700	800	900	1,000
K	18.5	10.5	6.5	4.75	4.2	3.9	3.5	3.1	2.8	2.5
Efficiency, %	100	57	35	26	23	21	19	17	15	13½
R.p.m.	100	100	100	100	100	100	100	100	100	100
Assumed diameter	5	10	15	20	25	30	35	40	45	50

K = Unit tractive force = $p\ xf$
p' = Unit normal pressure
f = Co-efficient of friction

given for the purpose of showing that not only the unit tractive force, K, decreases as the velocity increases, but, also the unit normal pressure p'.

In the case of leather-faced cone clutches, see Table VII, both of these factors decrease 50 per cent with an increase in velocity of from 1,800 to 5,000 ft. per min. In this case, the coefficient of friction, f, remains constant. It is rather surprising to find that the normal pressure decreases in this case, as motor car clutches are spring closed, the force of the spring remaining constant at all velocities, therefore the unit normal pressure should also remain constant.

In the case of asbestos-faced disk clutches, see Table VIII, the factor K decreases 60 per cent and the factor p' decreases only 20 per cent with an increase in velocity of from 800 to 3,600 ft. per min. In this case the factor f decreases 50 per cent.

The question can be asked here "why should the factor f remain constant for leather-faced cone clutches and drop 50 per cent for asbestos-faced disk clutches?"

In the case of cone clutches at high speeds, the decrease in the factor p' may be due to the centrifugal force of the inner member of the clutch, tending to open the clutch. The centrifugal force may resolve itself into two component forces, one at right angles to the friction surface and one parallel to same, and in a direction that opposes or neutralizes to some extent the closing force due to the spring. This theory, however, does not explain the decrease in factor p' in the case of disk clutches.

Modification of Factor for Increase in Velocity

Table IX shows a decrease in factor K of 86 per cent for an increase in velocity of from 100 to 1,000 ft. per min. In this case, the increase in velocity must be due to an increase in the diameter of the clutches as the mean velocity was taken at 100 r.p.m. for the reason as stated by Leutwiler, "That all the manufacturers rate their clutches at this speed." This was no doubt true at the time Leutwiler obtained his data, but as I have pointed out, some of the clutch manufacturers are now rating their clutches at different speeds.

Friction clutches wear rapidly when run at high speeds and when frequently engaged, unless the unit tractive force is sufficiently low and suitable materials for the friction surfaces have been chosen. The allowable unit tractive force is difficult to determine, because there are so many factors entering into the problem. The following method of finding same has been found very satisfactory. The principal difficulty being to find correct values for the different conditions, or factors. The values given have been arrived at after a study of all the available data at hand. This data is rather meager in some cases and contradictory in others, therefore the values will need correcting as more data is obtained.

Method of Finding the Allowable Unit Tractive Force

Let the unit tractive force $K = 50 \times A \times B \times C \times D \times E \times F$. The constant 50 being the unit tractive force K used in Table I, and A, B, C, D, E and F, being factors for different conditions, materials and types of clutches.

Factor A for Different Materials and Conditions of Friction Surfaces

Metal-to-Metal slightly greasy Cast-iron to cast-iron for slow speeds and light service. Cast-iron and bronze for slow speeds and heavy service.	1.00
Metal-to-metal with graphite paste and oil Cast-iron and bronze for velocities up to 2,000 ft. per minute. Steel and bronze for velocities up to 4,000 ft. per minute.	1.00
Metal-to-metal well lubricated (See note No. 1) Cast iron and cast iron, for general machine tool service at high speeds. Steel and steel, hardened and ground for heavy service at high speeds, where it is desirable to have clutches of small diameters.	1.00
Wood-to-metal slightly greasy Used in hoisting and transmission service.	0.32
Leather-to-metal slightly greasy Used in hoisting and automobile service.	0.24
Asbestos fabric on metal Used in automobile, transmission and other services.	0.24
Metal-to-metal with cork inserts slightly greasy Used in hoisting service and to some extent in automobile service. Cork inserts add from 12 to 15 per cent to pulling power, and have nearly the same friction qualities when lubricated as when dry.	1.12 to 1.15

Factor B for Different Kinds of Loads

Light starting load with steady running load	1.50
Light starting load with variable running load	1.00
Light starting load with light reversing load	1.00
Heavy starting load with steady running load	0.50
Heavy starting load with variable running load	0.33
Heavy starting load with heavy reversing load	0.25

Factor C for Manner of Engagement

For gradual engagement so as to pick up the load in an easy manner	1.00
For sudden engagement as when threading in a turret lathe	0.50
For instant engagement as with magnetic clutch	0.33
Note: For very slow speeds C should always be taken as	1.00

Factor D for Frequency of Engagement

For occasional engagement, as in line shaft service, etc.	1.50
For frequent engagement, as in most machine tools, hoisting or elevator service	1.00
For very frequent engagement, as when threading short work in turret lathe	0.50

Factor E for Different Speeds

For clutches up to 10 inch diameter (See note No. 2).	
For speeds up to 150 r.p.m.	1.25
For speeds up to 300 r.p.m.	1.00
For speeds up to 600 r.p.m.	0.66
For speeds up to 1,000 r.p.m.	0.50
For speeds up to 1,600 r.p.m.	0.20
For speeds up to 2,500 r.p.m.	0.10

FACTOR *F* FOR DIFFERENT TYPES OF CLUTCHES

Expanding or contracting ring types	1.00
Cone type	1.00
Multiple disk type (See note No. 3).	
Disks of cast iron, bronze or steel	1.00
Disks of saw steel hardened and ground	0.50
Disks of thin sheet-steel stampings hardened	0.25

Note 1—The wet or lubricated type of clutch requries greatly increased closing pressure on account of the low coefficient of friction. This type of clutch will slip under load without any appreciable wear and will pick up the load gradually without shock.

Note 2—For large diameter clutches, multiply the values given for factor *E* by the following multipliers.

Diameter	10	15	20	25	30	35	40	50	60
Multiplier	1.00	0.66	0.50	0.40	0.36	0.33	0.30	0.24	0.20

These multipliers were derived from table 9.

Note 3—Multiple-disk clutches are especially desirable where the service is severe and the speeds are high. The low values allowed factor *K* are on account of the slow dissipation of heat with this type of clutch. The thinner the disk the greater the tendency to heat. When running in oil a great number of disks are required on account of the low coefficient of friction, from 20 to 50 being used. When run dry from 8 to 14 are used. Materials used for clutch disks are, wood, cast iron, bronze, steel, saw steel hardened and ground, thin sheet steel stampings hardened and asbestos fabric. As a rule different materials are used in combination, as wood and cast iron, cast iron and bronze, bronze and steel, asbestos fabric and steel, etc. Asbestos faced disks alternating with steel discs are used quite extensively, especially in automobile service.

There are other factors entering into the clutch problem that should be carefully considered, such as the degree of finish on the clutch surfaces, conditions as to lubrication, temperature and moisture, presence of dust and grit, ease of operation, etc. Ease of operation is of course always of importance. As regards the degree of finish of clutch surfaces: Surfaces that are glazed so as to be as smooth as glass, or surfaces that have been ground very smooth, have much less tractive force than surfaces that are not so smooth or that still show the tool marks. As regards lubrication of clutch surfaces: Friction surfaces are very sensitive to the presence of oil. For example with wood to metal clutch surfaces, when dry, *f* may vary from 0.45 to 0.60, when lubricated slightly, *f* may vary from 0.07 to 0.30, depending upon the amount of lubrication. It takes but very little lubricant to reduce the value of *f* considerably.

There is this to be considered however, that the lubricant, while reducing the friction, also increases the resistance to wear, so that the normal pressure between the surfaces can be safely increased until the desired turning force is obtained.

A prominent clutch manufacturer, in his catalog states regarding the hp.-ratings of his friction clutches, that if the clutches are not submerged in oil that the hp.-rating automatically drops 50 per cent. In the case then of clutches submerged in oil, in order to transmit twice as great a load, the normal pressure per square inch must be at least four times as great as for the dry clutch, because the coefficient of friction is greatly reduced and the load doubled.

It may be a real problem in some cases to provide closing mechanism that will provide sufficient closing power and still not require too great an effort on the part of the operator.

Are Your Employees Educating Themselves?

BY HARRY BOTSFORD

"It's a queer thing," the branch manager of the world's largest correspondence school told the writer, "but very frequently my salesmen sign up a factory worker for one of our courses and when we ask him if he has any objections to our informing his company of the step he is taking, he objects in a very decided manner."

In the discussion which followed this statement the fact was brought out that some concerns and organizations do not fully appreciate the value attached to having a worker study to fit himself for a better position. It seems that this correspondence school—and the same thing is true of most other schools—always attempts to sell a man a course right in line with his own work. They succeed in doing this in about 80 per cent of the cases.

EFFECT OF EMPLOYER'S INTEREST

There is really no question today as to the value of correspondence school education, especially when it is backed by a reputable institution. Likewise, there is no question as to the relative value of two workers—one of whom is content to work at his one job, and another who is spending his spare time in an effort to become fitted for a more responsible job. Most concerns are watching closely the progress of their student-workers and they are able to do so by reason of the percentage slips which the correspondence schools send during the course of the education, providing the student gives them permission to do so. This permission is usually withheld if the worker believes that the institution which employs him is indifferent to his welfare.

For many years the correspondence schools have been compiling statistics on this matter and the figures are rather illuminating. The report that when the employer knows that a worker is taking a course, is informed of the progress of the student and shows some interest in it, that the student does just 37 per cent better work in his course.

EDUCATED WORKER'S QUALITIES

Two men voluntarily leave an organization. One is just an ordinary worker with no ambition to get ahead; the other is a man who has been fitting himself for a better job in his line of work. The first quits because of any one of a number of reasons; the other leaves because he seeks employment where he can take advantage of his hard-earned education. The latter is by far the more valuable employee but in terms of labor turnover the item covering these two changes merely indicates that two men have left.

One of the fundamentals of handling men in the mass is based on sensible and just appreciation of their efforts. If a man in an organization is willing to invest his own money and time in an effort to become a more efficient and valuable worker, it would seem only fair that the employer should take some interest in the case. No promises of advancement need be made—the usual method employed by most large concerns, such as Westinghouse, is that the student is informed that the company is pleased at his efforts to educate himself and that it will keep a shrewd and kindly eye on his progress. That is all that is necessary. If a worker then shows some outstanding progress, he is watched closely and promoted when he deserves it.

Why Country Garages Are Poor Customers

By Thomas J. Malone

THERE'S too much Jim and Bill stuff in the average country garage—at least, in the average country garage in Minnesota and neighboring states and, as a result, its business is none too desirable. That is the opinion of one of the largest firms dealing in machinery equipment in the Twin Cities. This concern carries a full line of automobile repair machinery, in which it does a large business, but it prefers selling to garages in the larger cities and cutting out the crossroads ones, except on one condition.

Why?

The reason given reflects on the business methods of the small town garage man. Much as the latter may not like it, there must be something to this opinion, for as a cold profit consideration, his money should be as acceptable as that of anyone else. It is, when it is in the hand or the pocket. Bad medicine may be good for what ails one, even when unpleasant to the taste; so here goes:

The machinery dealer was not sitting in a soft chair in a paneled office, smoking a fat cigar and polishing his nails, while he talked of why he regarded the small town garage man a poor customer. He was out on the warehouse floor petting a big turret lathe, and there was oil on his fingers.

Payment Requested with the Order

"Frankly we are not keen on getting business from country automobile repair shops," he said, "unless it's the cash-with-order kind. When we do take it on a credit basis, we soak a chattel mortgage on the equipment sold so that we retain ownership until liquidated. You might think that protected us fully, but it doesn't. We don't like to have goods back on our hands after months of use, and often of misuse.

"Our aversion to the run of country business is not due to any question of good faith or integrity. It is simply because experience has taught us to be wary of customers who do not observe good business practices in their own businesses. The best of intentions do not make up for a debt that isn't paid. The fact is that the average country automobile man is careless. He is wholly unlike his city cousin who has learned, doubtless through association and competition, to exact cash for services, keep books, figure costs, render statements and attend to collections.

"The country repair man too rarely keeps books. He trusts too much to his memory and to the honesty of customers; he is the victim of Jim and Bill habits. He knows most of his customers by their front names and does business with them on the hit or miss plan. Jim comes in, we'll say, with a bent fender, a broken spring or a stripped gear, maybe magneto or ignition trouble, or he wants his carbon removed. He says to the garage man, 'Fix the old bus up, Bill. I want to take the family to the picnic Sunday.'

"Bill fixes 'er up, and when Jim comes for the car he's in such a hurry that he hasn't time to do more than say, 'I'll square this with you, Bill, next time I'm in.' Bill knows Jim is all right, doesn't Jim's dad own the lower half of Section Three, with the red barn and the Holstein herd?, so he thinks he can wait until Jim comes in. It'll be only a couple of days, probably, and a fellow has to accommodate his friends if he expects to do business with them.

"Jim, it develops, does not come in in a couple of days, nor in a couple of weeks. He stays away from Bill's place, somehow. In the meanwhile, Bob and Hank and Cy and Jasper and a dozen or two others have their cars doctored, a dollar for this one, three for that, a five or a ten for a third, most of them stalling off paying until the cream check is cashed or the bunch of steers shipped or the potatoes marketed.

Cars of the Same Make

"Many of the drivers in a country neighborhood have cars of the same make, of the one make, if you get me. There'll be a supply shop for this car across the way from Bill's place. Sam brings his crippled boat to Bill for treatment, old friends and that stuff, you understand, and Bill rushes out to the supply shop for a needed part. He comes back and puts it on Sam's car, forgetting to enter it up against Sam.

"Now the manager of the supply shop, a newcomer to the town, doesn't forget to enter it up against Bill. Not he! He renders a bill in due time. His bills are likely to cover items that Bill himself had forgotten or had never made a record of. Bill supposes it must be all right, as of course it is, and he digs up, if he has the cash. If he hasn't, he stalls until he can make some collections.

"Just watch Bill collect. He starts out. He meets Jim at the post office and Jim has trouble in recalling what Bill did for his car. Then he wonders if he hasn't paid for the job already. Bill is quite sure he hasn't and names the figure.

"'You robber!' says Jim, on hearing for the first time what that figure is. 'Why didn't you keep the car? Your tinkering wasn't worth all that. Cut it in two, and maybe I can shake dad for it.'

"Bill needs the money. He cuts it in two.

"Sam takes his time, too, about paying up. He knows if he had done business direct with the supply shop, he'd have had a statement promptly and would have paid it soon. But Bill is an old friend and it's different with friends. Then, too, look at all the business that Bill gets just because the fellows know him and want him to do well!

"If all the other Sams and Jims paid promptly, everything would be all right, but they don't. My cases are fairly typical.

Memory a Poor Substitute for Book-keeping

"Bill realizes before long that he's playing an uphill game. He's busy all the time, but he isn't meeting his bills. Too little cash business. He began by trying to keep accounts in his head and it dawns on him after a while that he's forgetting a lot of them, not the big jobs, of course, but the little odds and ends that count up so heavily month in and month out. Besides Bill guesses a good deal as to what a job is worth.

"If he faced the truth, Bill would see that he was by way of being the town philanthropist to car owners. He probably never had any specific training for the business, got shunted into it from the local livery stable or bicycle shop most likely, and his schooling and later experience had not taught him the necessity of booking every transaction, gaging costs accurately, charging adequately for profit, mailing bills promptly, insisting

on collections and, above all, getting cash down when possible.

"Finally it comes to Bill that he is in a bad way. Too much is going out and too little coming in. His memory and such records as he does keep, on backs of envelopes, the wall calendar and the state road map tacked to the back of the door, contain a fat list of accounts, all good in the sense of being able to pay, but, well, in the end Bill begins borrowing on his life insurance to meet his bills. That's the beginning of the wind-up. He's going to be closed out as sure as taxes.

"And when it happens, Bill will not understand why. Aren't there two hundred cars owned within ten miles, not to speak of transients? Wasn't his place always busy? Didn't he have to keep an assistant almost from the start? Yes, but he had to pay that assistant's wages, the assistant saw to that, and rent on the shop, installments on the equipment, gasoline, his own living expenses, suffering cats, what didn't he have to pay-for!

"The machinery man fondled the lathe again before wiping his hands.

"What Bill needed," he ended, "was less of the friendship-in-business idea and a good stiff course in an honest-to-goodness business college."

The Man Who Knows Why

By Entropy

Ask each of your friends why he does his work the way he does, and the chances are that the men who know why are the ones that are foremen or superintendents or are on the way to promotion to those jobs. They may be draftsmen, they may be in many other jobs in the shop or office, but that one thing almost surely differentiates between the men that are advancing and those that stick in one place year after year.

"How is a man to learn why?" "Everybody does it this way; what's the use of knowing why?" These are the answers that come if you try to get a friend that is down in the rut to brace up and study for advancement. Friendship and favoritism go a long way sometimes in getting a job, but there are very few jobs that are worth while that are held that way. The man must prove his ability on the job, and the man that can do it is the man who knows why he does everything that he does. The rule-of-thumb man is less and less in evidence every day.

Some say, "We never had a chance to get an education; what can anyone do without an education?" They need to be told what an education is. Education is not going to school. Education is learning, which enables one to think things out for himself. Time was when if a man wanted to build a bridge strong enough to carry an oxcart and a thousand brick, he built it strong enough so that it would carry all the oxcarts in the country. After awhile someone gathered together data on the sizes of timber that were used in building a few hundred bridges, and developed a formula for oxcart bridges. But today we do not use these arbitrary or empirical formulas; we work the thing out from careful laboratory tests on various woods, and then we reason on the beam theory.

When a man, although not a student by nature, attempts to educate himself, he is very apt to think that it is the education which counts. Perhaps some other people make the same mistake, college professors included; but when a workman sets his mind on getting ahead, he is usually too old to have much time to waste on anything that does not further his ability to command a better job. At that stage he cannot afford to clutter up his mind with details that may not be of any value, or the value of which may be different by the time he gets a chance to use them. He must keep down to the essentials if he is to make good soon enough to make it pay to study. More than that he must make good use of his time, because ninety-nine times out of a hundred he must earn while he learns. So he must find out in some way what are the essentials.

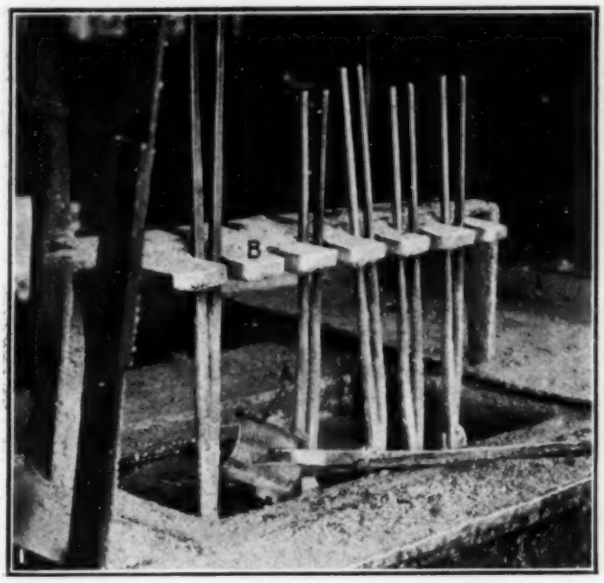
This man discovers that the essentials are usually the fundamental principles. If he knows those he can fill in the details on the job from day to day. If he is working along mechanical lines, he finds that the fundamentals are only a few and that they are included in what is known as mechanics; that is, statics, strength of materials, dynamics and kinematics, to use the professors' names for them. He finds that a general knowledge of heat and electricity helps him to understand many things. If he is in a machine shop he finds that he must understand the cutting of metals, that he must be able to measure, and that he must understand limits and tolerances and why they are made as they are; but of all these things the key-note is mechanics. Not but what everything else is good, but mechanics is indispensible. If he will study that, then he is headed for better things; and his study, if he stops and understands each step, makes it easy for him to take up the other things which are good to know, but not nearly so essential.

Advantage of Self Instruction

But how is a man who works every day to learn mechanics? In colleges there are professors to lecture and advise, there are laboratories. If a man is so situated that he can attend a good night school which has the use of laboratories, then there is no question but that he should take advantage of the opportunity. The lack of professors is not so serious. Even the men who go to college do not get much coaching from their professors. Their contact is with instructors who know, sometimes, as little as the pupils.

What a man needs most of all is not coaching, it is not answers to questions, but it is a professor who will make him study out things for himself. A dictionary is a very good book to have, but even a dictionary has the fault that it is so easy to look up a word and find its meaning that most of us fail to remember it, and we have to look it up again if we run across it half an hour later. In the same way a professor or instructor at one's elbow in college is a harm, because it is so much easier to say that one does not know and ask a question than it is to work out a problem. Yet that is the very reason why a self-made man is likely to forge ahead. He has had to think out a great many things that college men have only had to ask questions about.

The best college professor is one who merely steers his pupils in the general direction they should take and insists that they find their own way, rather than take them by the hands and lead them. So no one should feel discouraged if he has nothing but books from which to work. If he cannot think out his problems with the aid of one book, try another, even if only at the public library. If he is unable to work it out himself, of course then he should ask some one who knows, but it is much better for him if he hesitates to ask as long as possible.



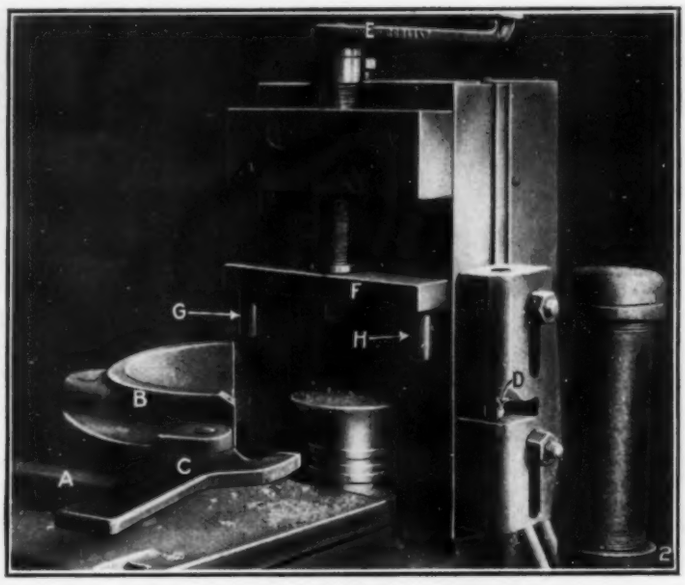


FIG. 1—HOLDING-TONGS AT THE TINNING TANK. FIG. 2—THE BABBITT-CASTING MACHINE

Methods of Making Babbitted Bearings

By FRED H. COLVIN
Editor, *American Machinist*

A special machine for casting the babbitt lining and a double-headed fixture for boring and facing—Form grinding with a built-up wheel

THE MAKING of babbitted bearings involves a number of operations, some of which are not altogether common in the average shop. The bearings shown in the different views are the long bearings which are held in the forked connecting rods of the well-known Cadillac eight-cylinder motor. These are bronze backed bearings, the bronze castings or shells being rough turned and rough bored before babbitting. The coarse feed used in boring can readily be seen in the bearing at *A* in Fig. 1 as well as in Figs. 3 and 8. This probably helps rather than hinders securing a close union between the shell and the babbit lining.

The bearings are first cleansed by being dipped in acid, and are then tinned in the tank shown in Fig. 1. It will be noted that the rack *B* is so designed as to hold the tongs in position by forcing the handles together while holding the bearing suspended in the tank.

After being tinned the bronze halves go to babbitt-casting machine shown in Fig. 2, where they are located one at a time in the position shown, by means of a V-block operated by an eccentric controlled by the handle *A*. This holds the bearing firmly against the face or wall of the machine. The gate or funnel *B* is next swung to position over the bearing, and held in position by the latch *C* on the pin *D*. Turning the crank *E* forces the crosshead *F* down so that the two pins *G* and *H* bear against the edges of the funnel and hold it in close contact with the upper end of the bearing in order to prevent leakage of the babbitt. A lever on the other side of the machine controls the plunger which has a half cone on the upper end, the plain portion forming the inside of the mold for the babbitt, and the cone end giving it a head or riser, as can be seen from the bearing in Fig. 3. This mass of metal effectually prevents any shrinkage as the shell cools.

The bearing shown in Fig. 2 has already been poured, as shown by the riser. One line of the piping shown is for city gas, and the other for compressed air. There are two sets of gas pipes, one for heating the front and the other the back. The large pipe shown at the right was originally used for taking the temperature

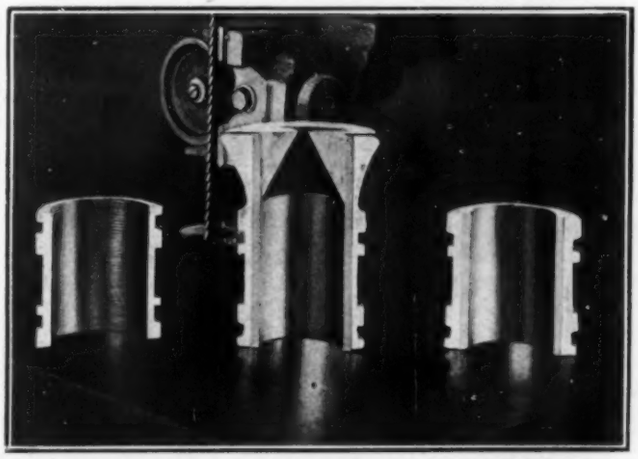


FIG. 3—BEARING SHELLS IN DIFFERENT STAGES OF LINING

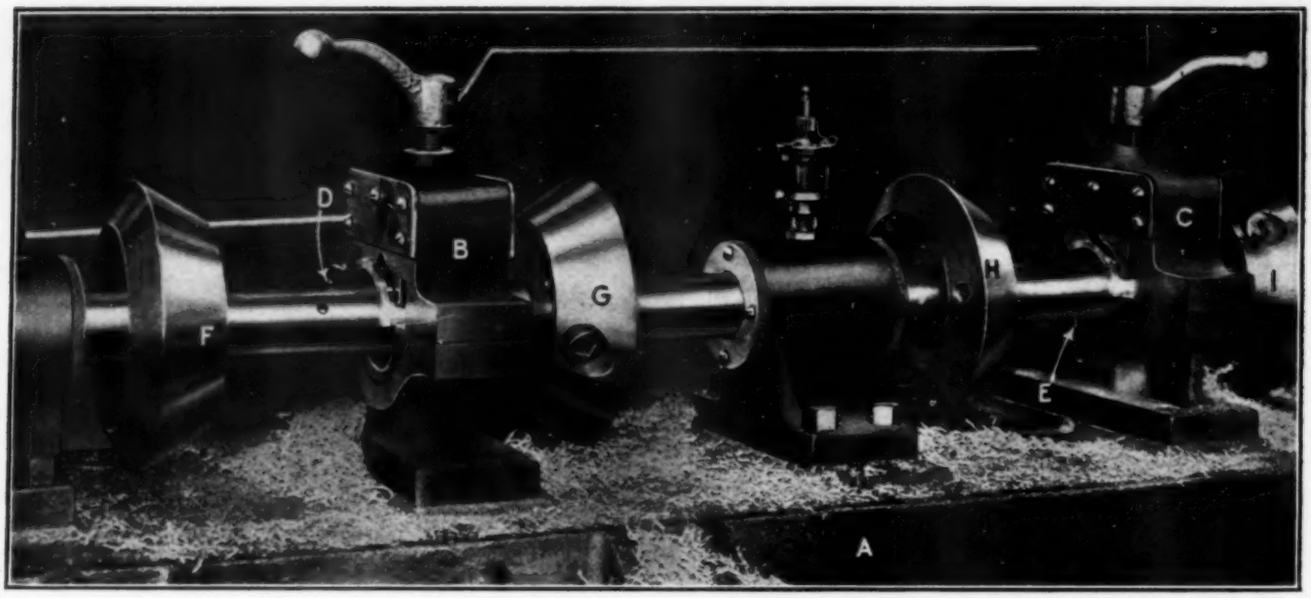


FIG. 4—BORING AND FACING THE ENDS

of the machine. This pipe was filled with oil, and the temperature of the oil bath taken at stated intervals. This practice proved to be unnecessary, and has since been abandoned.

In Fig. 3 is shown a bearing after being tinned, but before babbitting, one with the riser in place, showing the effect of the coned plunger, and the third, after the riser has been removed by the bandsaw.

An interesting method of boring and facing the babbitted bearings is shown in Fig. 4, where a double-headed fixture has been mounted on a standard lathe. It consists of the heavy base *A*, two work-holding heads *B* and *C*, and three heavy bearings for the boring bar. The bar carries single-point boring cutters as at *D* and *E*, and also substantial facing cutter heads, *F*, *G*, *H* and *I*. These heads are provided with cutters which turn the outside of the bearings on the ends, face the ends, and also chamfer the inside.

The bearings are easily and quickly clamped in posi-

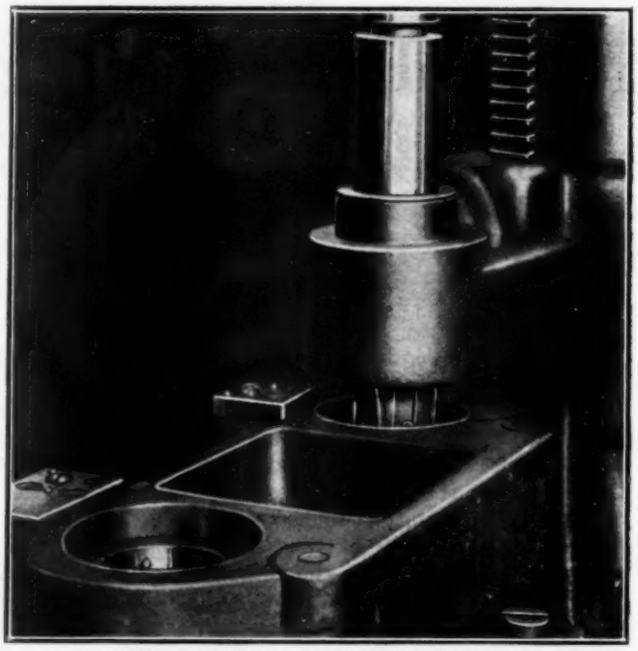


FIG. 6—REAMING THE BABBITT LINING

FIG. 5—FINISHING ENDS OF A COMPLETED BEARING

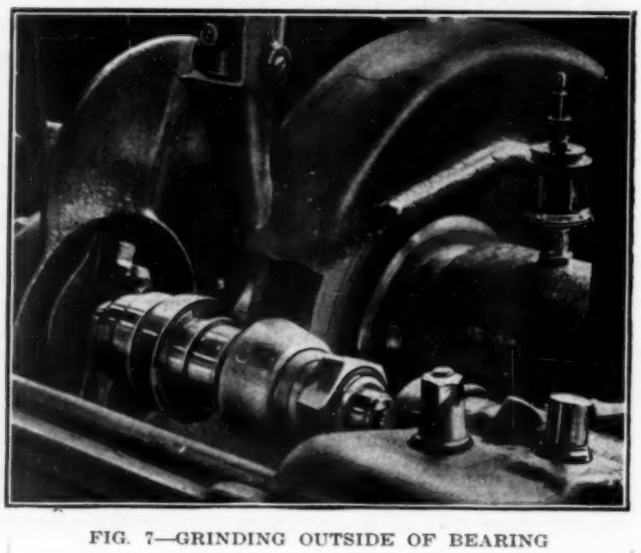


FIG. 7—GRINDING OUTSIDE OF BEARING

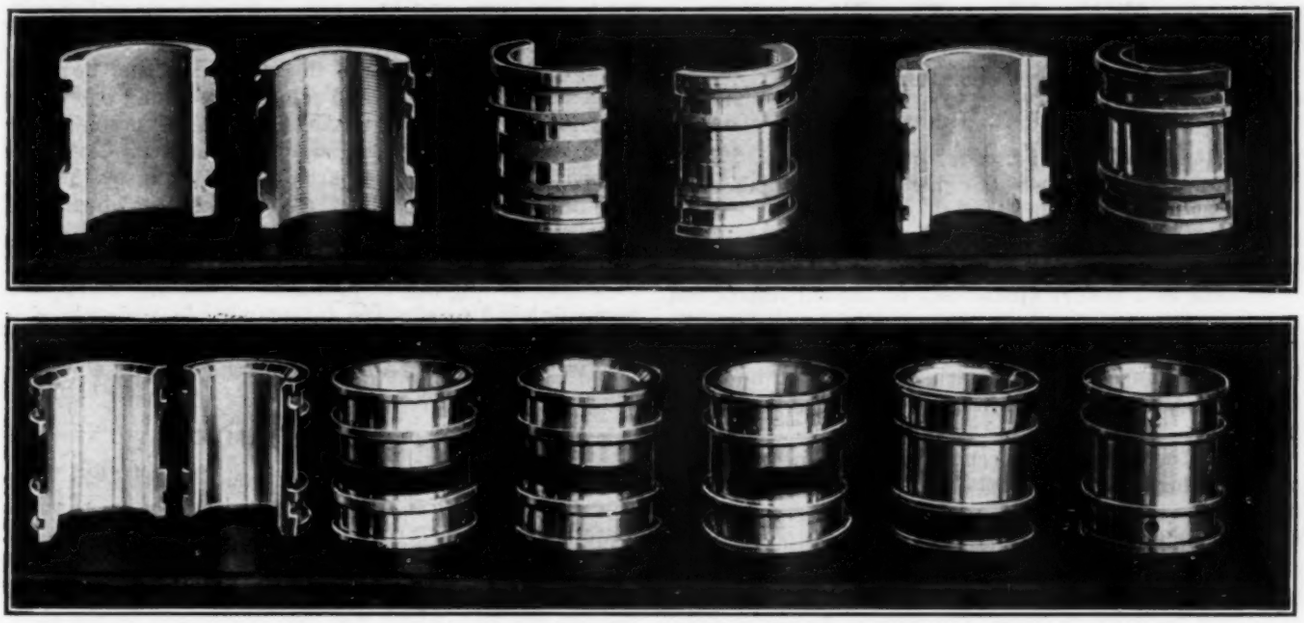


FIG. 8—VARIOUS STAGES OF CADILLAC BEARINGS

tion in the work-holding blocks, being centered by the V-shaped clamp on top. Suitable stops make it easy to face the bearings to their proper length by simply feeding the boring bar through, first in one direction and then the other.

Another lathe operation which finishes the outside ends of two half bearings as a single unit is shown in Fig. 5. Here a collet or draw-in chuck is used for quickly and accurately centering the pair of boxes.

The final reaming of the bearings is shown in Fig. 6, where a special double fixture is in position on a heavy-duty drilling machine. The bearings are clamped in the double-ended fixture shown and the operator loads one end while a bearing in the other end is being reamed. This secures almost continuous operation.

The outsides of the bearings are finished by grinding, as shown in Fig. 7. The bearing shells are held on a mandrel by two collets, one at each end, and the whole outer surface is ground, including the two rings. This involves the use of three wheels and two spacing disks. The wheels grind the outside diameter of the bearing and both sides of the raised rings, being held the proper distance apart by the spacing disks. Bearings in various positions and in different stages are shown in Fig. 8, the sequence of operations beginning at the left in the upper row and proceeding to the finished bearing at the right on the lower row. The spring clips on some of the bearings show how the mating pairs are held together. By moving the clips to different positions, the various finished surfaces are shown.

The Foreman and the Suggestion Box—Discussion

BY J. HOMEWOOD

The elimination of the suggestion box as advocated by Frederick A. Pope on page 572, Vol. 58, of the *American Machinist*, is a thrust at the democratic conditions now prevalent in the majority of the most prosperous institutions in this country.

True it is that there are many suggestions coming from the knockers and from a few super-minded egotistical individuals who do not know how to manage their own personal affairs and attempt to offer suggestions as to how the plant should be run.

What is more satisfying to an employer than to be able to stand aloof, so to speak, and have a perspective of the mental situation of the whole plant? The suggestion box is nothing more than a safety valve whereby each and every one has a chance to express not only an idea pertaining to an improvement but to protest against some uncomfortable condition existing that would not be countenanced by the manager.

Do away with the suggestion box and depend upon the foremen to develop and encourage the men to think and suggest! If the foremen had sufficient time at their disposal, if all foremen were broad-minded and if all foremen were working for the very best interest of their employer, the writer might approve of doing away with the system, but such is not the case. A foreman as a general rule has none too much time to do justice to the work on hand. He has to be a general mind reader, expert estimator, timekeeper and a score of other things while on duty. He has not the time to spend upon the details pertaining to the suggestions that would be taken up with him.

The foreman should be broad-minded enough to consider suggestions from the viewpoint of benefit to the firm and should not feel offended or hurt because the information did not come through him. He should realize that his capacity is limited like any other well put-together human being, and that the surplus of valuable ideas is going to a cold storage "over his head" so as not to disturb his continuity of progressive thought. It may be possible that if the suggestions are made out in duplicate, one being given to the foreman at the same time that the other is dropped in the box, that such a feeling as slight may be eliminated. This would also enable the foreman to look over the suggestion when he did find a minute of freedom from his other details, thereby preparing him for the subject when it is taken up with him by the suggestion chaser. When we have an element that assists employer, employee, foreman and efficiency, why eliminate it?

Know Why You Do Things—Discussion

By S. R. Hunter

On page 565, Vol. 54, of *American Machinist*, John Brent, in an article under the above title, makes the statement that "The idea that the form of tool to make a gear tooth can be properly produced by a machinist is all bosh"; which makes us wonder where Mr. Brent is located, as I believe almost any of the old timers can point to the satisfactory solution of this problem at various times in his experience. In justification of this belief I am appending herewith the story of how one such job that came within my own experience was handled.

To get the proper perspective it will be necessary to say that the job here described was handled entirely by four all around machinists, consisting of the following: the superintendent, the department foreman and two of the regular shop men. It was not in a "small country shop," but in a representative manufacturing plant.

One of the large horizontal boring mills broke down by the stripping of a cast iron worm, which in turn

FIG. 1. THE SPECIAL FINISHING CUTTER

so badly mutilated the worm gear in which it meshed as to necessitate replacing the gear as well as the worm.

A telegram to the manufacturer of the boring mill brought in reply the information that new parts could not be shipped inside of three weeks. This meant a layup of the machine for at least a month as it would have required about a week for the parts to be delivered and installed. After a rather hurried conference between the superintendent and the foreman of the department it was decided to make the worm and gear in the shop where they were to be used. The necessary measurements were taken of the parts and it was found that the gears were not of standard pitch. This necessitated checking up the center to center distance between worm and gear and figuring out the rest of the dimensions.

In the meantime, while this work was being done by the superintendent, the foreman was supplied with rough pencil sketches of the bore, length and keyway dimensions of the worm (which was to be made of steel) and of the worm gear hub. The old worm and gear were both of cast iron and it was decided to turn off the outside of the old gear and shrink on a rough turned bronze ring, then to finish turn and cut the teeth.

A sketch of the ring, with a pattern order, was sent to the pattern shop and while the worm, worm gear, and pattern for the ring were under way the superintendent and foreman completed the necessary calculations to obtain the dimensions required and planned the shop operations to enable the parts to be made without unnecessary delay or interference with regular production work. The ring pattern was completed in less than an hour after the order was placed and the bronze casting, which was about 30 in. in diameter and 3 in. thick, was delivered "too hot to handle" at five o'clock the same day. As soon as the casting could be handled, the foreman notified one of the machinists that he could go home as soon as he had rough turned and bored the ring to size to shrink on the hub. The foreman and the other machinist were on the job at five o'clock the following morning. The partly finished ring was placed in boiling water for about 45 minutes and shrunk in place on the hub, after which a hole was drilled half in the hub and half in the ring and a taper pin fitted to insure its staying in position. While the blank was being finished to size the foreman made a sketch of a cutter (Fig. 1) for the teeth, as the diameter of the new worm was too great to permit the use of a standard cutter.

How the Cutter Was Made

The machinist who bored and rough turned the gear ring had, in the meantime, returned and he was immediately started in on the cutter. This was made by chucking a flat piece of annealed carbon tool steel and boring it to fit the spindle of the little No. 2 Garvin milling machine which was the largest one in the shop. After keyseating, the cutter blank was put on a short arbor and turned to within 0.010 in. of the finished diameter. A female templet was used to obtain the correct contour. After being turned, the cutter was shaped up and backed off by hand, and was hardened and ground. In hardening, the cutter was distorted slightly and it required some stoning in order to make it fit the finished templet. The milling machine had been set up in the meantime and, as the diameter of the blank was too great to permit its being cut on a vertical plane, it was necessary to swing the dividing head over and mount the blank in a horizontal position, as shown in Fig. 2.

After the dividing head had been set at the proper angle a model of the gear blank, made of hard wood, was mounted and enough teeth cut to enable a check for angularity to be made. The setup was found to be correct, using the new worm to check by. The special cutter was then replaced by an ordinary gear cutter of the same pitch as that required in the new worm gear, the intention being to remove as much stock as possible with the ordinary cutter and to save the special cutter for the more important job of shaping the teeth. After the stocking operating had been finished the blank was cooled thoroughly and the final light cut taken, leaving the teeth about 0.002 in. over size in thickness at the pitch line so they could be scraped to a bearing in the worm. This was however, found to be too much stock to leave for scraping in, as it took several hours to finish the scraping job before the worm and gear would mesh without over-heating. The entire job as outlined was

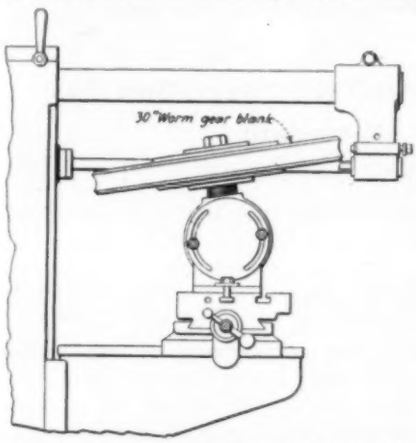


FIG. 2. SETUP FOR CUTTING WORM GEAR TEETH

finished on the third day after being started and the boring mill was put in operation the morning of the fourth day. The work might have been expedited somewhat if a different method of procedure had been followed but it would have been a difficult matter to convince anyone of the participants in this stunt that any time could have been saved by any other means than those used.

Truly the machinist's job is, as Mr. Brent says, to make chips, and the foregoing only goes to indicate how chips can be made in wholesale quantities, as there were eighteen men dependent on the output of the machine repaired and had it been tied up for a month waiting on repairs these men would have lost three weeks work at the least and the loss to the company would have been several thousand dollars.

The job was not mathematically, or even mechanically correct, but it was much better than the job turned out by the machine tool builder as, even with the slight discrepancies, the steel worm working in mesh with a bronze gear would give much better service than would a cast iron worm driving a cast iron gear. After the boring mill was put in operation it was discovered that it had lost its ability to leave mysterious "chatter marks" on finished surfaces. It was supposed that the chatter marks were due to the back lash of the old gears, as they were badly worn. The worn surfaces were highly polished but did not show signs of cutting. This was, doubtless, due to the fact that these gears were well lubricated as they were run in an oil bath continuously.

Allowing for Gage Wear

BY AXEL C. WICKMAN
Alfred Herbert, Ltd.
AND
E. C. PECK
General Supt., Cleveland Twist Drill Company

ON PAGE 953, Vol. 56, of the *American Machinist* is an interesting article on Allowing for Gage Wear in which at first it would appear that two entirely different systems of gaging were laid down. The first is the practice of R. Dumas, Works Manager of the British Thomson-Houston Co., while the second is that advocated by E. C. Peck, General Superintendent of the Cleveland Twist Drill Co. The main basis of difference stated is that Mr. Dumas, given a certain tolerance of manufacture on a component, would allow the tolerance of manufacture of the gages and the wear limit of the gages to fall outside this tolerance, whereas Mr. Peck states that given a certain tolerance on the component, the manufacturing tolerance of the gages and wear limit on the gages must fall inside. This is an excellent example of the type of pseudo-problem which is derived from the mental transformation of a simple analogy to an absolute identity, or from a partial difference to a perfect contrast.

If we examine carefully the two apparently different problems placed before us we will see that actually no two such problems exist, that they are one and the same thing stated in a different way. To show this it may be well to take as a simple example, the production of a plain hole in a piece of cast iron and assume that this plain hole shall act as a bearing for a shaft. It is obvious that there will be a maximum tolerance in the hole beyond which it will not function satisfactorily.

Suppose that this maximum tolerance is represented by the difference between the lines *A* and *B* in Fig. 1. The hole will be tested by means of a double ended plug gage, one end of which must go in and the other not. A tolerance must be allowed for the manufacture of the gage and therefore the small cross-hatched section *AC* will represent the tolerance of manufacture of the "go" gage, whereas *DB* will represent the tolerance of the manufacture of the "not go" gage. It must be obvious that these tolerances cannot fall outside the lines *A* and *B* since they represent the maximum tolerance between which the part will function correctly.

It is also obvious that if we manufacture our gage as shown, the go end of the gage will wear and if it actually falls on the line *A*, immediately any wear occurs, holes will be produced which may fall outside our maximum tolerance. It is, therefore, necessary to place the tolerance of the go end of the gage as shown at *E* so that a certain amount of wear can be allowed before the gages are scrapped. The amount of the wear limit need not be discussed here, as it does not enter into the argument.

We now have a distance *ED* (assuming that our gage tolerance and wear limit has been correctly proportioned) and this is the manufacturing tolerance for the shop when the gages are new.

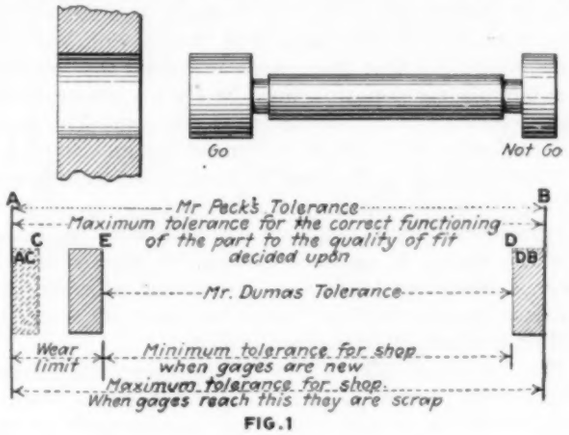


FIG. 1

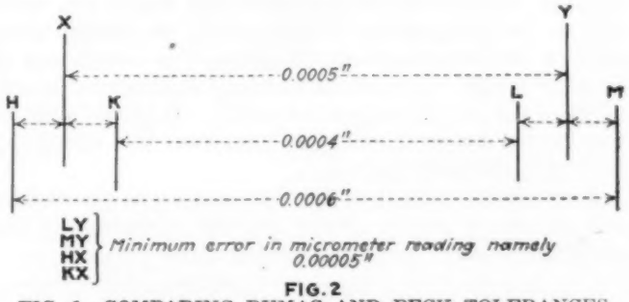


FIG. 2

FIG. 1—COMPARING DUMAS AND PECK TOLERANCES
FIG. 2—EXAMPLE OF GAGE TOLERANCE

Now the difference in the case of Mr. Dumas and Mr. Peck is this, that when Mr. Dumas speaks of his tolerance on the component, he means the distance *ED* whereas when Mr. Peck speaks of it he means the distance *AB*. But the distance *AB* is fixed by the definite mechanical functioning of the parts and therefore cannot be dependent on any human element. It may be that different people would require a different functioning, that is, a different fit for the same part, but once the fit is established there is one, and only

one, maximum limit for the particular fit that is desired.

It may be argued that the tolerance *AB* is very often fixed in a haphazard manner and that the component may function correctly. Obviously, this argument kills itself, since it should be the aim of every manufacturer to use the maximum tolerance that can be allowed in conformity with the proper functioning. This practice makes the article cheaper to produce, so that the total difference between the arguments of Mr. Peck and Mr. Dumas merely resolve themselves into a different realization of what the tolerance on a component is. If component tolerances were properly fixed with regard to mechanical functioning only, the same tolerances would be used in the shop, whether the gages were made according to Mr. Dumas' idea or whether they were made to Mr. Peck's.

One word is necessary—it has been the writer's unfortunate experience to discover that in the large majority of well equipped engineering works, the question of tolerance is one in which there exists an enormous amount of self-deception. It is frequently observed that the tolerances on the blue prints are exceeded by 25 per cent and often 50 per cent, due to gage wear and inaccurate standardization, without the people responsible being aware of what is going on. This is because a certain tolerance appears on the blue print and the gages appear also to be made to that tolerance. The work passes the gages and they go on year after year imagining that their work is within the tolerances.

A simple case of this may be shown where a workshop tolerance of ±0.00025 in. is allowed. The gage in the majority of cases is measured by means of a micrometer which, in the best of conditions only, is standardized against slip gages. The gage is made so that the inspector finds a difference of 0.0005 in. between the two ends. It must be obvious to anyone that this measurement must have an inaccuracy at each end of not less than 0.00005 in. under the most ideal and most skilled method of operation.

The two lines *XY* in Fig. 2, represent the tolerance, viz.: 0.0005 in. The actual size of the gage can therefore fall 0.00005 in. either side of the standard and so under the best conditions (when subsequent gages are made due to the replacement of worn ones) the actual tolerance on the component can be as much as 0.0006 and as small at 0.0004 in., in other words, a variation of nearly 50 per cent of the actual tolerance. This variation is not caused by wear or gage tolerance, but simply by incorrect standardization.

I need hardly add that the ideal conditions stated here are seldom, if ever, realized and the variations in the majority of cases are considerably above this.

AXEL C. WICKMAN.

THE FINAL SUMMING UP

Mr. Wickman does not seem to have discovered the difference between the two methods under discussion. Either the discussions are not plain or he has not found the point argued about. He does, however state my side of the discussion exactly and shows plainly by his sketch, Fig. 1, that he believes in the method I advocate, but he fails to see that Mr. Dumas wants the gage tolerances outside of the component tolerance and that his method necessitates an exact check or master gage to limit it.

Referring to the discussion on page 953, Vol. 56, of the *American Machinist*, one must either accept or reject the fundamental I laid down, namely; that the component tolerances represented by master gages must *never* from any cause whatsoever *be exceeded* either from wear of the gages or inaccuracy.

If this fundamental is rejected true interchangeability cannot be maintained because there will of necessity be an interference of metal. This interference of metal would take place in close fits or those without an allowance if the gage tolerances were taken outside of component tolerances.

On the other hand, if this fundamental is accepted, gage tolerance must of necessity fall inside the component tolerance in order to meet the requirements. It is absurd in practice to quibble about robbing component tolerance by gage tolerance, because if gages cannot be made exact by gage makers it is useless to quibble about this value on the product.

I am a firm believer in, and have always advocated, the largest component tolerances which will function properly. Then there need be no quibbling over gage tolerances as this amount is too small to really measure on anything except the very finest product.

E. C. PECK.

Depreciation of a Lathe—Discussion

BY A. W. FORBES

On page 576, Vol. 58, of the *American Machinist*, C. J. Morrison replies to my question as to the depreciation of a lathe, by giving the rate of about 10 per cent per year regardless of its present condition. He bases this on the statement that a lathe in use ten years will bring but little more than the price of the scrap. If this is true why should anyone buy a new lathe?

Special lathes have been developed in the last ten years that do vastly more economical work for certain operations, but in the plain engine lathe, we see but slight change, so the question of obsolescence does not enter to any appreciable extent, and if it did obsolescence and depreciation are different things.

Yet since writing the first item, I have had an experience that would lead me to think that Mr. Morrison was right. A firm was selling out its equipment, and among the items was a lathe, which may have been ten years old, that was offered at what seemed like an extremely low price, so I purchased it. There were some outs about it such as excessive play in the cross slide, but one of my boys discovered that this was merely a matter of adjustment, and he had it working right before the lathe had reached its location in our shop.

I have since found that the lathe was in better condition than I had thought when purchasing it, so that I am inclined to think that another of my boys (both under sixteen years of age) was right when he said, "After we have used this lathe a month it will be just as good as that one," pointing to the one I mentioned in the *American Machinist* as ten years old and giving better service than when new.

Is it possible that experienced purchasers of machine shop equipment will let lathes as good as those being sold new at the present time, go for practically scrap value, just because they have proved that they are good by ten years of satisfactory service? Or are there not enough purchasers of such equipment who can tell the value of a second-hand machine, to take the quality machines that are offered?

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Hot Swaging Under a Drop Hammer

BY HERBERT CRAWFORD

The hot swaging of heavy pipe is quite common in connection with the making of oil well tools and supplies. A very good example was found in the shop of the Mills Machine Co. where bull plugs and reducing sockets were being made under a drop hammer.

The dies are nothing but heavy blocks of cast iron bored to suit the diameter of the pipe, and having the

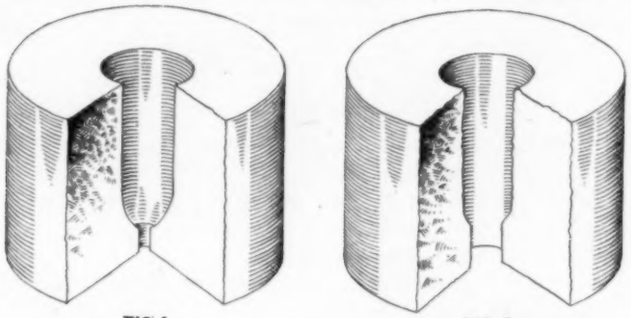


FIG. 1—BULL PLUG. FIG. 2—REDUCING SOCKET

proper shape to give the desired contour to the finished piece. The bull plug is simply closed at the end with a sort of acorn point as in Fig. 1. A single blow of the hammer drives it down into the die and practically closes the end. The small opening is then welded with an oxyacetylene torch.

The reducing sockets are still more simple, as indicated by the die, Fig. 2. A single blow drives the sockets into the die and gives the desired reduction. Strippers in each case push the finished piece up out of the die.

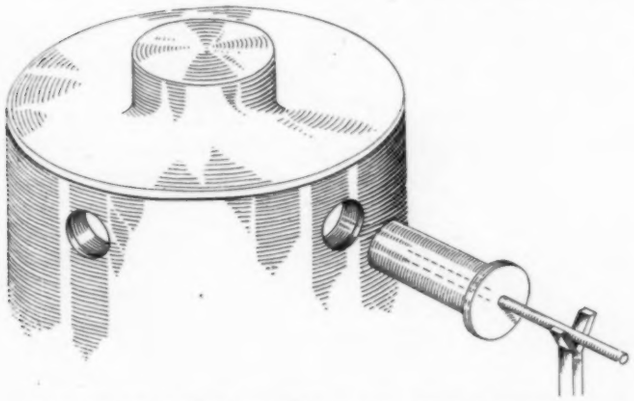


FIG. 3—OIL FURNACE FOR HEATING PIPE BLANKS

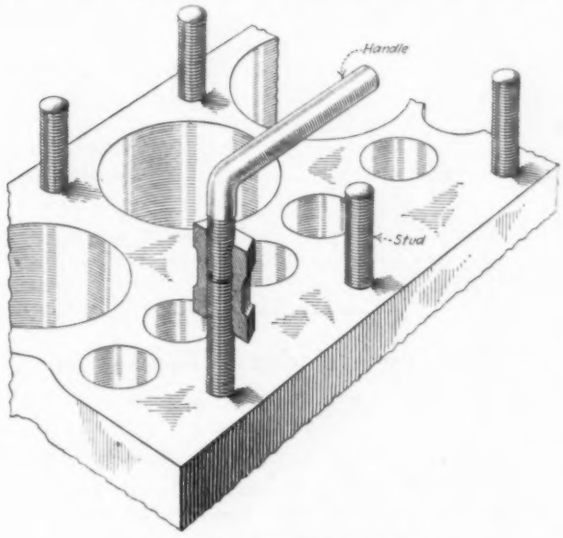
The furnace used is also of interest. It is circular, a steel shell with a brick lining, and with four openings around the top as shown in Fig. 3. Oil is used as a fuel and there is no trouble experienced in heating the blanks fast enough to keep the hammers busy.

The blanks, pieces of pipe cut off to proper length, are held on a rod about 4 ft. long provided with a collar which prevents the hot blank from slipping down against the hand of the operator. The collar also enables him to push the blank into the opening without difficulty. The outer end of the rod rests in a V-shaped rest as shown.

A Stud Driver for the Mechanic

BY LOWELL R. BUTCHER

A pipe wrench is frequently resorted to in replacing the studs in a cylinder block, sometimes with disastrous results to the stud. Another method is to screw on a nut and use it as a means to get a purchase to tighten the stud. When an attempt is made to remove the nut, the stud will often loosen and turn out. The stud driver shown in the illustration will drive the



A SIMPLE STUD DRIVER

stud home and may be released without loosening or damaging the stud.

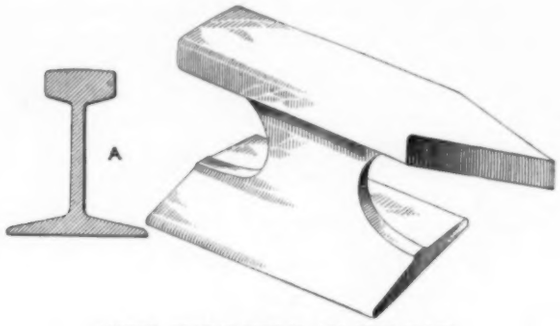
The center portion of the tool is made of a short piece of cold-rolled steel, drilled and tapped to fit the stud. It has flats filed or machined on the outside so that it may be gripped with an ordinary adjustable wrench. The handle and upper part of the tool is made of round stock the same size as the stud. One end is bent over to make a handle and the other is threaded the same as the stud.

To use the tool, the handle section is screwed part way into the middle section and the entire assembly tightened onto the stud. Turning the stud by means of the handle will jam the end of the stud against the end of the handle in the collar and the assembly may be turned as a unit. After the stud has been tightened down, grip the center section with a wrench and give the handle a partial turn out. The tool will then unscrew easily from the stud.

Making Anvils from Old Rails

By Frank C. Hudson

One of the things instructor J. B. Phillips of the university of California, southern branch, does, is to have the students make up a few anvils from old rails. The rails are very heavy, about 120 lb. to the yard, by their looks and have a very deep web. A section is shown at *A* in the illustration. The pieces are cut off



ANVIL MADE FROM AN OLD RAIL

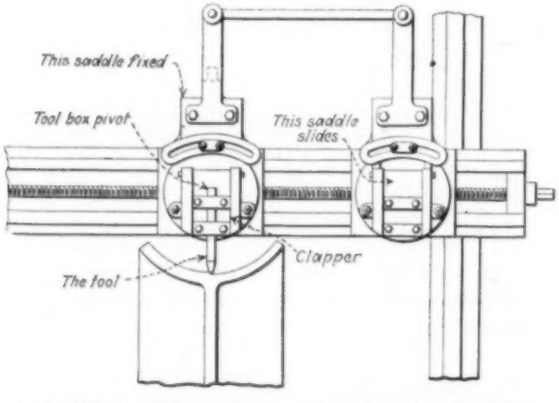
about 16 in. long and the web cut out at each end as shown. This is usually done by drilling a series of holes along a line previously laid out, chipping away the metal between the holes and filing to shape. It would be a good job on which to teach cutting with a gas torch.

The head of the rail is planed to about the shape shown. This squares up the edges, makes the top flat, and gives a very convenient form of horn for a variety of work. The edges of the horn are rounded on top in some of the anvils made. There are many places where an anvil of this size and type will be found very handy. Making anvils in this way gives an opportunity for several kinds of machine work as well as chipping and filing.

Planing a Radius—Discussion

By J. T. Towlson
London, England

I wish to voice a decided objection to the practice of using a dividing head in the manner suggested by Robert T. Wilson on page 933, Vol. 57, of the *American Machinist* for the purpose of planing a radius. A dividing head is an instrument of precision, designed and constructed mainly for the purpose of making accurate divisions, and is not at all calculated to withstand the drastic abuse that would be imposed upon it by taking cuts with a planer tool located at a considerable radial distance from the center.



RADIUS PLANING ON A DOUBLE-HEAD PLANER

As if the abuse to the dividing head were not enough Mr. Wilson would rob the planer of a protecting member in the shape of the clapper box and would mount the head directly upon the slide, which would still further increase the probability of causing damage.

Radius planing, far from being a casual job in machine shops wherein I am acquainted, is almost considered routine work. With a double-head planer arranged as shown in the sketch it is a very simple matter to obtain almost any radius by merely adjusting the point of the tool to the desired distance below the stud upon which the swivelling head swings.

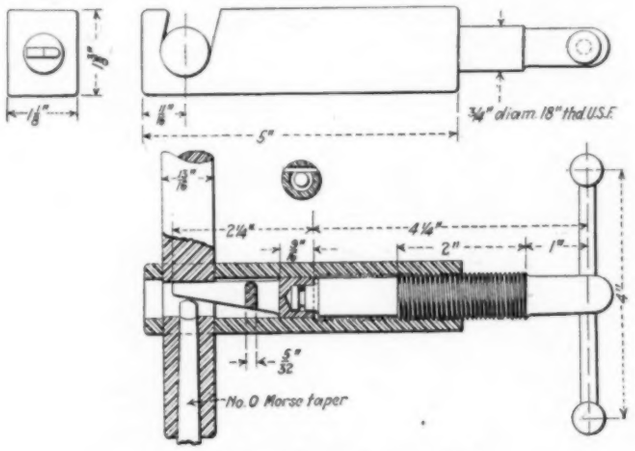
This method has the advantage that the extra parts required are few and inexpensive, and can be used repeatedly. Also the feeding mechanism is already provided for and, once set, the job can take care of itself as readily as the planing of a flat surface of equal area.

A Screw Operated Drift Key

By W. Burr Bennett

I recently designed a small drilling machine in which the spindles were reamed to take a No. 0 Morse taper shank. Because of the very small diameter there would have been danger of damaging the spindle if an ordinary drift and hammer were to be used to take out the chucks; therefore I designed the screw operated drift, shown in the sketch, for the purpose.

The body of the tool is made of a piece of cold rolled steel of rectangular section, drilled lengthwise through the center to receive the drift and tapped part way through for the forcing screw. A notch is cut at a



SCREW OPERATED DRIFT KEY

slight angle in one side of the body, as shown, in order to allow the tool to be hooked around the spindle when it is used, and thus any side strain imposed by the forcing screw is counterbalanced.

The sectional view shows the construction of the tool and the manner of attaching the screw to the drift so that the pressure of forcing the latter is borne by the end of the screw, while the cross-pin at one side of the center serves to hold the two parts together as the screw is withdrawn.

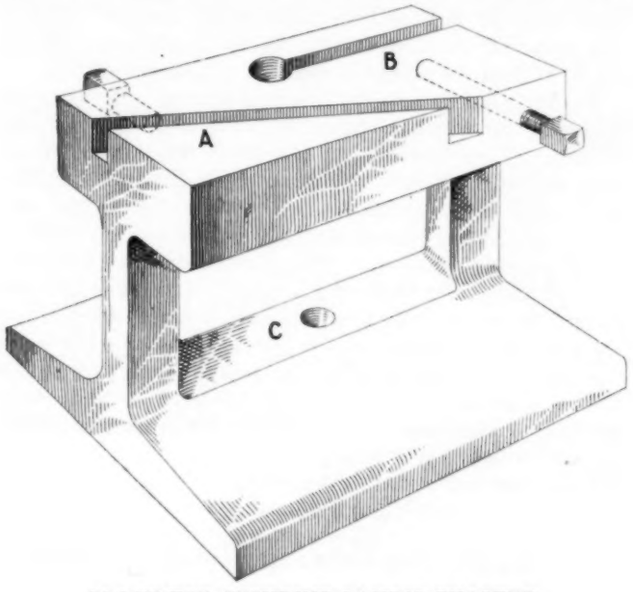
The drift is milled from a single piece of round stock and is pack-hardened.

Block for Grinding Die Chasers

BY CLIFFORD H. FRENCH

The block or fixture illustrated herewith is made from a piece of rail about 6 in. long. It is planed on the bottom of the flange, the head is planed to make a flat-top, rectangular block, and the web is cut out in the center both for lightness and to afford a place for a bolt to hold the block on the table of the grinding machine.

The two slots *A* and *B* are cut with a shaper. The



BLOCK FOR GRINDING LANDIS CHASERS

first is at a correct angle to give the desired top rake to the chasers of a Landis die head, the other is for grinding the back end square. This simple but convenient little device was made by J. E. Govett for use in the tool room of the Great Northern Railway shop at Hillyard, Washington.

Cylinder Wear in the Far West

BY HERBERT F. CRAWFORD

Builders of automobiles, and other machinery for that matter, can learn a lot about their product by visiting the shops which repair it. Shops that re-grind cylinders are full of information as to the different makes of motors.

One of the large re-grinding shops in Utah insists that, almost without exception, cylinders of the cars built during the past five years wear out faster than those previously made. If so, and their records prove it for that locality, the reason would seem to be in the use of softer iron to secure more rapid production in machining. The management of this shop has gone into the matter very carefully and can estimate the length of service fairly accurately, by the cylinder wear, for cars built within that time. It figures 0.0005 in. for each 1,000 miles, or 0.005 in. for a car which has run 10,000 miles.

Nearly all cylinder blocks go out of shape in use, so that when it comes to re-grinding the bores it is usually necessary to take out enough stock to square them up with the face in order to do a really good job. There is, of course, no harm in the bores not being exactly vertical or radial, but when they are out of square fore and aft, bending stresses are imposed on the connecting rods, wristpins and crankshaft which means wear on pins, bearings and the cylinder walls. But when re-grinding the bores, those who want the best work grind them square with the face of the block, regardless of the extra metal which must be removed.

In some cases the face of the cylinder block is found to be warped and must either be scraped or ground flat, or else the block so juggled on the grinding fixture as to average up the error. As the average re-grinding shop has no facilities for doing either scraping or grinding the face of the block, the latter method is usually employed. It is probable that much of the warping could be eliminated by a proper aging or seasoning of the cylinder casting, as was formerly done. But in these days of large production this becomes a difficult problem. Annealing the cylinder block is practiced in some factories and should help, but this is not common practice.

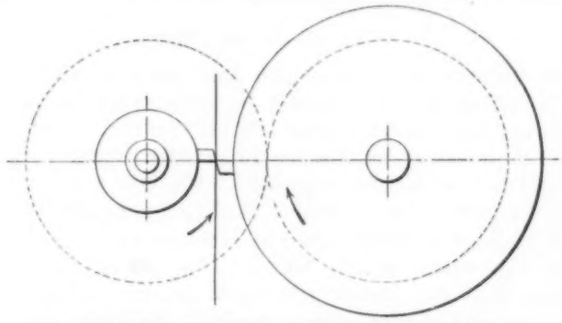
It is quite probable that the amount of wear stated would not be correct for eastern localities, as it is due in no small part to the presence of dust in the air being drawn into the carburetor and finding its way into the cylinders. This is a vital factor in sections of the country where both plain and desert are without rain for months and where much dust is always in the air over the highways, even when there is wind. The larger tractor builders take great precaution to use large filters to keep the dirt and dust out of the air intake of the carburetor. Under extreme conditions a motor has been worn enough to require overhauling in a single day's run. All of which indicates that dust exclusion from the carburetor would be a help in any locality.

Device for Cutting Bagging

BY I. B. RICH

Bagging is such a loosely woven material that it presents quite a problem in cutting, especially when the cutting must be done from the roll and rapidly. The sketch shows a device by which a small shop in a city on the Pacific coast solved the problem.

The bagging is fed between the cutter heads shown, one head being 4 in. and the other 12 in. in diameter.



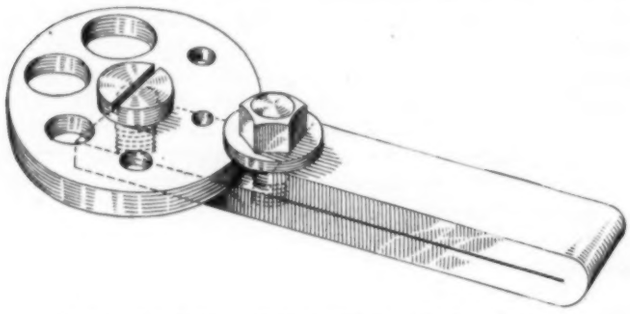
SHEARING CLOTH WITH ROTARY BLADES

Both are driven at the same rotative speed by equal gears on their respective shafts. This difference in diameter gives the knife on the larger head a surface speed three times as fast as that on the smaller head, giving a shearing action as the blades come together with the cloth between. The knives have a top rake of 6 deg. which has proved very satisfactory. The pitch line of the gearing is shown by the dotted circles.

Tool for Centering Small Round Parts

BY HARRY MOORE

Having a number of small round castings the shanks of which were to be turned, with very little stock to be removed, a special tool was made as shown in the sketch to help in centering the various diameters. A square center was used in the tailstock of the lathe, but instead of forcing the work to a concentric position by means



TOOL FOR CENTERING ROUND WORK IN LATHE

of the back end of an ordinary tool, the result was obtained much more quickly and with a greater degree of accuracy by using this device.

The shank of the tool is made of ⅜x1-in. flat stock bent double for a part of its length. A disk, also ⅜ in. thick, is spaced off and drilled to correspond to the various sizes of stock for which the tool is designed. The disk is held to the shank by a flat-head screw that allows it to be rotated when setting it for the different sizes, and is clamped tightly in position by means of a capscrew and washer at the rear of the disk.

With the shank of the tool held loosely in the toolpost, the tail-center is advanced and the disk adjusted until the center bears evenly all around the hole, when the toolpost screw is tightened. It will be seen that a piece of work of the size of the hole thus centered is at once brought to a concentric position without the necessity for center punching and drifting, as is generally done on this kind of a job.

Regrinding, Reboring or Reaming Cylinders

BY M. I. SEILER

In cylinder regrinding you have soft metal to work with, which is much harder to grind with fine results than are hardened surfaces. It also requires a man who has had years of experience to grind a cylinder so that it will not be tapered instead of straight. In cylinder grinding the abrasive wheel, coming in contact with the soft walls, will smash down or bend over the small chips that are made by the wheel. The small crevices or pores, that are always left by a grinding process and are only noticeable with a magnifying glass, are filled with the small chips that are bent over.

In grinding hardened work this does not happen, as instead of the small chips bending over, they will break off and be washed out with the compound used. But on soft work, such as cylinders, the compound will not wash out all the abrasive fast enough to prevent some of it from remaining under the small chips.

The result of this method is a fine finish to the naked eye, but after the pistons are fitted in and the motor run for a certain period of time, the bent-over chips will gradually work loose by the pounding of the motor and by the movement of the pistons, and let out the small particles of abrasive that have been smashed down and hidden under them. This abrasive, mixing with the oil that works up between the piston and cylinder walls, will form a grinding compound and wear your pistons down.

Reboring with four or six tools fitted in a head and operated by hand or power, works fairly well. It does not leave any abrasive or small chips in the cylinder walls. The only fault is that if the engine block has hard spots in the casting, these small, narrow tool bits will wear off as they strike the hard spots and throw the hole that is being bored out of alignment.

Reaming gives a very fine and lasting job, as eight to ten good strong blades fit into the body of the reamer. These blades, made from high-speed steel, have proved that they will ream right through the hard spots that are so often found, without dulling the cutting edges of the blades, and will not throw the cylinder walls out of alignment. The very fine marks that may be left in the cylinder wall after reaming have also proved to be of benefit in retaining small amounts of oil while the pistons are in operation. In some cases the reamer is set to give the piston a very snug fit, and the piston is then lapped in with a fine valve-grinding compound. However, the job that has proved to be the most satisfactory is to ream a smooth hole to the size wanted and do no lapping.

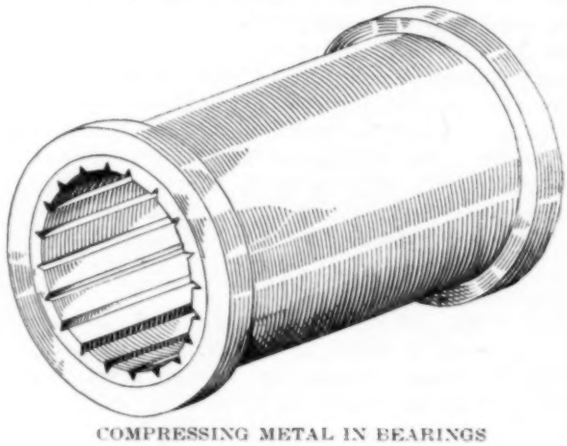
Compressing Bearing Metal in Shells

BY CHARLES F. HENRY

One of the problems in soft lined bearings is to get the babbitt solid. In the old days we used to peen it in with the ball end of a hammer. Some use a button broach or burnisher in the case of small bearings and compress the metal in that manner. This however, requires considerable pressure and makes it necessary to support the bearing shell on a substantial die.

The Western Machinery Co., of Los Angeles, Calif., make some large bearings with comparatively thin shells and could not use the button broach method. So the superintendent, John Langdon, made a broach which forced grooves into the babbitt lining as it went through and compressed the metal against the shell at the points of contact and also sidewise between the broach teeth.

This method puts lengthwise grooves in the bearing as shown but has proved very satisfactory in securing more solid metal than before it was used.



COMPRESSING METAL IN BEARINGS

Oil Bit with Two Disks

By R. E. Marks

The earth formation in the oil fields around Los Angeles evidently differs from that found in Texas, if the kind of drilling bits used is any criterion. The holes are usually started with a two- or four-lipped bit of something over 15 in. in diameter, as in Texas. But when they start drilling in the deeper and harder layers, the type of bit shown in Fig. 1 seems to predominate.

The bit consists of a heavy steel casting with two offset jaws on one end and the usual sharp taper thread

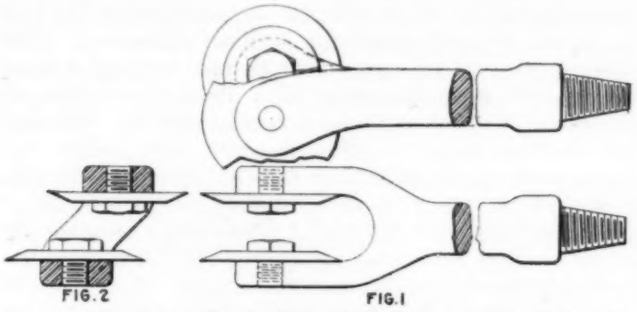


FIG. 1—DRILLING BITS USED AROUND LOS ANGELES SECTION. FIG. 2—STEEL CUTTING DISKS IN PLACE

at the other end of the shank. The offset jaws each carry a steel disk, shown in Fig. 2, which has a beveled cutting edge, the disks revolving as the bit is turned by the drilling head (for rotary drilling prevails here, as in Texas). Ths disks are free to revolve on the studs which hold them to the shank, and so present their entire cutting surface as the bit is turned by the rotary head.

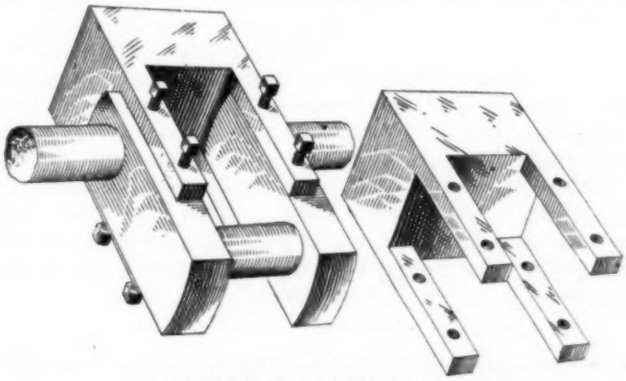
The shanks for the drills are made in various jobbing shops in and around Los Angeles. The turning is done in standard heavy-duty lathes, the jaws are planed on planers or shapers, and the holes are drilled and tapped under radial drilling machines.

Finishing Large Crankshafts by Filing

By Chester H. Franklin

Making crankshafts for good sized gas or oil engines, where the pins and bearings run from 4 to 6 in. in diameter in quantities insufficient to make it profitable to install special machinery, presents several problems to the man who is responsible for production.

The only answer seems to be to use an engine lathe large enough to swing the crankshaft or else block one up for the purpose. Grinding machines of sufficient capacity are out of the question because of high first cost and limited production.



A CONVENIENT COUNTERBALANCE

There is nothing new in making false center or end plates which fasten on the ends of the shaft for turning the crankpin at the proper throw. But the counterweight shown herewith, for balancing the crank while turning the main shaft, is a little out of the ordinary.

It consists of a husky block of steel with four legs as shown. These legs go over the cheek of the crank and are fastened by the setscrews shown. The counterweight can be adjusted in and out on the crank to secure the proper balance, and the same weight answers for several sizes of crankshaft. It is also fairly convenient to handle.

When it come to real accuracy, the makers know that perfection is not secured by these methods. But they do get remarkably good results considering the equipment used. The interesting feature is that the old time mechanic still holds sway on this kind of a job for the pins generally have to be finished by careful filing to overcome the out-of-roundness due to spring of the shaft. It seems all wrong but it works just the same. The machinist turns the pin the best he knows how, then he carefully "mikes" it at a dozen places and in different positions, which usually shows the pin a few thousandths out-of-round. The errors found are corrected by careful filing down of the high spots or large diameter, more measurements with the "mike" and final polishing when the job is satisfactory. And this means when the pin is within a half thousandth of being round.

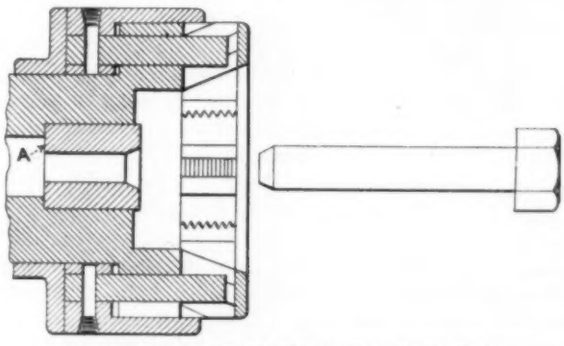
The accuracy of two-point measurements is, of course, open to question but the pins run and give good satisfaction while without the final corrections by filing they do not. And some say we don't need machinists any more!

Pointing and Threading Bolts at One Operation

By Henry C. Francis

During two operations at one set-up and without rechucking is first cousin to making two blades of grass grow where only one grew before. So here is the way the Yula Manufacturing Co., Marysville, Calif., saves one handling in the pointing and threading of bolts.

It is accomplished by simply putting the pointing tool,



POINTING TOOL IN SELF OPENING DIE

which is a sort of hollow mill with a beveled cutting edge, inside the self opening die as shown at *A*. Then, before closing the die, the operator runs the bolt in through the die and points it. Withdrawing the bolt and closing the die chasers, he cuts the thread as usual and the job is done at one chucking.

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Editors

May 17, 1923

Illegal Activities Of Trade Associations

TO THE LAY mind the charge of Judge Van Fleet to the jury in the case of the United States of America versus The Trenton Potteries Co., et al., is one of the clearest expositions that has yet appeared of what trade associations cannot do under the Sherman Act. Every member of a trade association ought to have a copy of the stenographer's notes of this charge. In what follows we can hope to give only the outstanding features and trust that they will make sufficient impression upon the reader for him to want to study the charge in full.

Judge Van Fleet, after complimenting the various parties concerned in the conduct of the case, read to the jury the provision of the Sherman Act under which the indictment had been returned. It is as follows:

> "Every contract, combination in the form of trust or otherwise, or conspiracy, in restraint of trade or commerce among the several States, or with foreign nations, is hereby declared to be illegal. Every person who shall make any such contract or engage in any such combination or conspiracy, shall be deemed guilty of a misdemeanor, and, on conviction thereof, shall be punished by fine not exceeding five thousand dollars, or by imprisonment not exceeding one year, or by both said punishments, in the discretion of the court."

There are two counts in the indictment. The first one charged that the defendants had entered into a combination and conspiracy to restrain interstate commerce in sanitary pottery by arbitrarily fixing and maintaining non-competitive prices for the sale, shipment, and delivery of their product among several states.

The second count charges that the defendants further conspired to restrict interstate commerce by limiting and confining their sales of sanitary pottery to a special group selected by the defendants by agreement and known by them as "legitimate jobbers."

In explaining the law to the jury the Judge pointed out that there is nothing in the law which prevents an individual from selling his goods at any price that he chooses or making any profit that suits him, or selling to any particular class or group that he may select. Moreover there is nothing in the law which prevents business men or corporations from joining together into trade associations for the legitimate protection of their lawful interests. So long as the trade association formed to conduct lawful activities confines itself to these activities it is in no danger of prosecution under the Sherman Act. But if, in addition to its lawful activities, it indulges in any practice prohibited by the law it promptly becomes an illegal combination just as much as though it had originally been organized for illegal purposes.

As to what constitutes a violation of the Sherman Act, it is hardly possible to do better than quote Judge Van Fleet. He says, "Under the provisions of the Sherman law the mere agreement on the part of the members of a combination in restraint of trade constitutes an offence and it is immaterial whether anything is done by the combination, its members or agents towards the carrying out or performance of such an agreement. The mere making of the agreement though nothing is done towards its accomplishment is in itself a violation of the law. * * * A conspiracy under the Sherman Act requires no act or effort to carry it into effect but is complete the moment it is formed. It differs in this respect from the Conspiracy defined in Section 37 of our Criminal Code. * * * * The latter requires the doing of some overt act to complete the offence but the conspiracy denounced in the Sherman Act does not. It is a completed thing the moment the evil purpose is determined upon by those associated. It differs from a combination in that the latter, as I have stated, may in its inception be an innocent association and assume its criminal character later. This is not so with a conspiracy under this act. The latter is a criminal thing from the moment it is formed. * * * The precise form or manner in which the understanding or agreement is arrived at or brought about is immaterial so long as there exists a common understanding between the parties to accomplish the criminal purpose. The statute makes it unlawful to enter into such combination or conspiracy and makes everyone who is a party thereto equally guilty without regard to the extent of his activities as compared with those of other members."

Further on in his charge Judge Van Fleet stated that any member of an association engaged in a conspiracy who entered it some time subsequent to the inception of the conspiracy was as guilty as though he had been instrumental in the original conspiring. So long as he was aware of the illegal acts engaged in by the association as indicated by his own actions he is deemed equally guilty.

In this case as in most other cases of the kind some of the defendants were apparently less guilty than others. As regards their situation the charge said that mere passive knowledge of the existence of a combination or conspiracy or of the illegal actions of others in connection therewith is not in itself sufficient to make the one securing such knowledge a member of the unlawful association. The evidence must satisfy the jury not only that he had knowledge of the existence of the conspiracy and its unlawful purpose but that with such knowledge he knowingly participated to some extent with the members of the combination with the purpose of aiding in the common design. This knowledge and participation of a defendant are, like the question of intent and the existence of the conspiracy itself, to be gathered from the circumstances.

Shop Equipment News

Artos K.N. No. 3 Automatic Cutting Machine

A recent addition to the line of automatic measuring and cutting machines of the Artos Engineering Co., 306 Milwaukee St., Milwaukee, Wis., is the K.N. No. 3 automatic cutting machine shown in the accompanying illustration. This machine will cut heavy flexible and semi-flexible materials such as copper and steel wires, cables, straps, belting and heavy wickings up to 3 in. in width into lengths varying from 14 in. to 14 yards.

ARTOS K.N. No. 3 AUTOMATIC CUTTING MACHINE

The mechanical operation is as follows: The cutter head on which the two knife levers, the two clamp levers and the gage are located, turns around with the shaft. By means of slide bars, the knife and clamp levers are moved up and down in relation with the clamp base. The material is held between the clamp base and the clamp, and as one of the two clamp levers is always down on the clamp base the material will not be released, but as the shaft rotates it will be automatically fed. The knives on the knife levers cut with a scissor effect against knife blades mounted on the base.

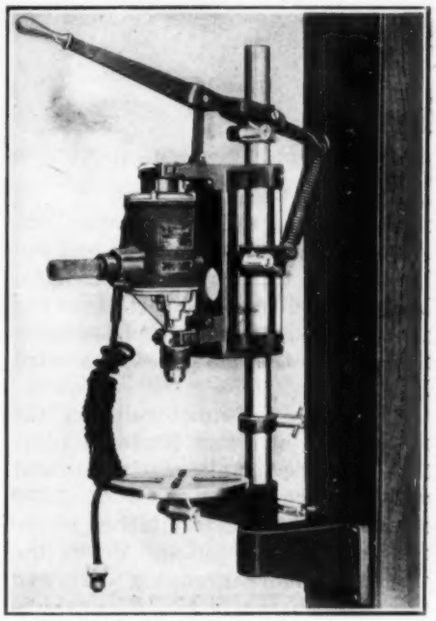
The length of cut is decided by the position of the gage, which can be moved out or in on a graduated gage bar. When cutting pieces 14 to 28 in. in length, both knife levers are in action and two pieces are cut for each revolution. To cut pieces 28 to 56 in. in length, one of the knife levers is brought out of action by means of an insert and only one piece is cut per revolution. If pieces longer than 56 in. are cut, one of the knife levers is again brought out of action and the other lever is made to come down either every second, fourth or eighth revolution, depending on the length of cut desired. When cutting over 56 in., a long attachment mechanism is required.

The working operation of the machine is as follows: The operator starts the material into the machine, sets the latter for the desired length and throws in the lever. The machine then automatically measures, cuts and records the number of pieces cut. Adjustments for length of cut are made by moving the gage finger along the graduated gage bar. The machine is power driven, the standard equipment including a clutch pulley. Electric motor drive can be furnished.

Portable Electric Post Drilling Machine Stand

Standard portable drilling machines may be converted into stationary types by the use of the post drilling stand, shown in the accompanying illustration, which has recently been placed on the market by the Standard Electric Tool Co., Cincinnati, Ohio. This stand can be mounted on a wall or post and it allows a portable drilling machine to serve a double purpose, namely as a stationary and portable device.

The bracket which holds the drilling machine can be fitted at any point on the column and it is raised and lowered by means of a clamping screw. A quick return and easy feed are claimed due to the method of mounting the lever and spring on the bracket. The stand is furnished with a slotted table 9 in. in diameter that, like the bracket, can also be adjusted to any point within the limits of the column.

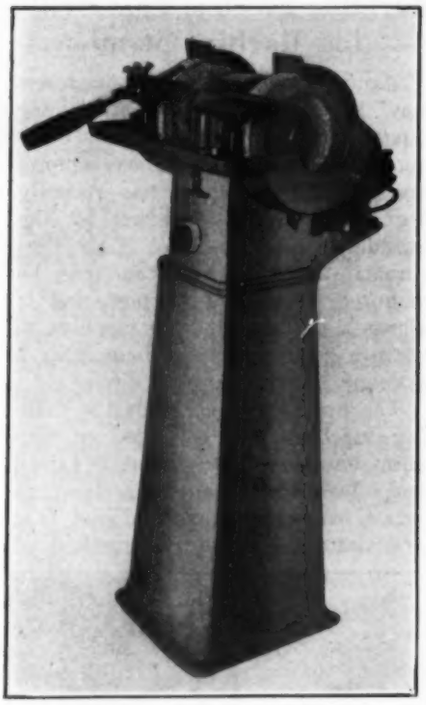


PORTABLE ELECTRIC POST DRILLING MACHINE STAND

The stand has an overall height of 36 in. and net weight of 75 lb. The distance from the center of the table to the column is 6¼ in. A vertical adjustment of 15½ in. is provided for the bracket that holds the drilling machine, while the latter has a travel of 3¼ inches.

"Efficiency" Electric Tool Grinder

A grinder built especially for use in grinding wood-working tools and particularly adapted for pattern shops and trade schools has been placed on the market by the Efficiency Grinder Co., Madison, Wis. An attachment by which the tool can be held at the correct angle while being passed back and forth over the face of the grinding wheel is shown in use on the machine illustrated herewith.



EFFICIENCY TOOL GRINDING MACHINE

The machine is motor-driven, the motor used being an Emerson ½-hp., 110-volt type for alternating current and running at a speed of 1,750 r.p.m. The motor is attached to the rear of the machine and drives the machine spindle through a worm and wheel which run in oil. The spindle is of steel and runs in bronze bushings. The wheel on the right end of the spindle is a Norton alundum 8 x 2 x ¾ in., 46-M, and is used for roughing. The finishing wheel is a Norton alundum 8 x 2 x ¾ in., L 897-N+. Both grinding wheels run in an oil bath, so that constant lubrication is provided.

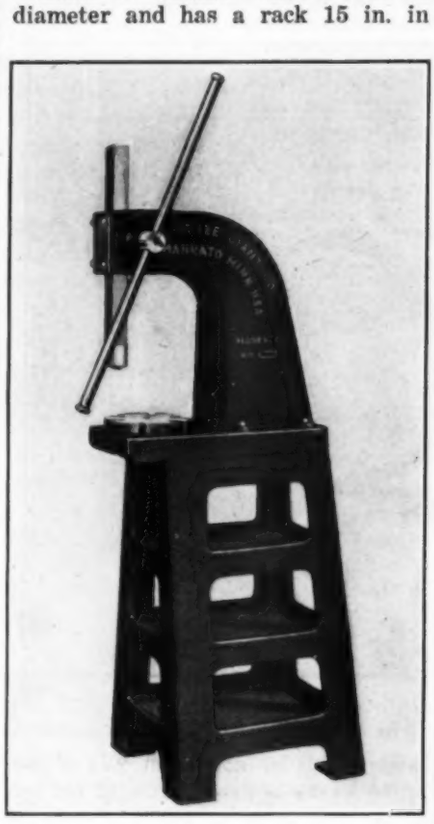
The spindle runs at a speed of 245 r.p.m., which is calculated to be the correct speed for grinding wood-working tools. The floor space required is 18 x 20 inches. The machine can be supplied with or without the pedestal, as required.

"Little Giant" Arbor Press

By the use of special attachments on the recently developed arbor press shown in the accompanying illustration many operations such as punching, shearing, crank shaft and axle straightening, broaching, stripping and assembling may be performed. The device is manufactured by the Little Giant Co., Mankato, Minn.

The machine is hand operated and is made in five sizes handling work from 10 to 42 in. in diameter. All have alloy-steel racks that are shouldered on both sides to protect the gears which are made of heat treated and case hardened alloy-steel.

Model A handles work 10 in. in diameter and has a rack 15 in. in length with a travel of 9 in. The press above its base is 17 in. high, weighs 140 lb. and occupies a space of 7 x 15½ in. The base to which the press is shown attached is 33 in. high, weighs 100 lb., and occupies a floor space of 11 x 15 in. The leverage ratio is 40 to 1, so that one man can exert a pressure of 5 tons when the press is geared and 3 tons when not geared. Two men can produce pressures of 8 and 5 tons respectively under the same conditions.



"LITTLE GIANT" ARBOR PRESS

The special devices included are shearing, punching and broaching attachments. The shear attachment has a blade 3 in. in length capable of shearing work up to $\frac{5}{16}$ x 3 in. The punch attachment has punches ranging from ⅛ to ¾ in. in diameter which will cut holes in material ⅛ to $\frac{5}{16}$ in. in thickness. The broaching attachment has a maximum capacity of ¼ x ⅛ in. Other attachments include a straightening device for such work as a bent crankshaft and axle and various stripping and assembling devices for use on jack and gear shafts.

Barrett 1-Ton Portable Derrick

The latest addition to the line of lifting and handling devices developed by the Barrett-Cravens Co., 1328 West Monroe St., Chicago, Ill., is the Barrett 1-ton portable derrick shown.

The device is made of two major parts, a beam, which includes the hoisting mechanism, having a reach of 3 ft. 4 in., and a stand. The hoisting mechanism consists of two sheaves at the end of the beam which permit the load to be carried with one, two or three strands of cable, the hoisting being done by means of two handles which may be worked simultaneously by pushing with one hand and pulling with the other as shown. A feature of the block used is that it has a ball bearing swivel shackle to prevent cable twisting. One operator can conveniently lift 300, 600 and 1,000 lb. by using respectively, one, two and three strands of cable with speeds of 50, 25, and 17 ft. per min., while two men, each operating a handle, can readily lift 600, 1,200 and 2,000 lb., using one, two and three strands.

BARRETT 1-TON PORTABLE DERRICK

The derrick has an overall height

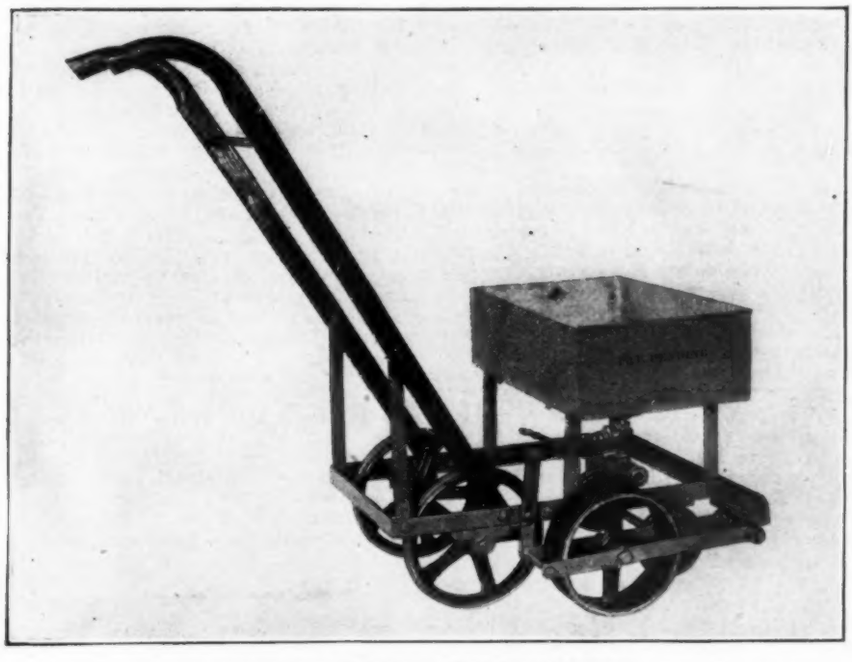
of 7 ft. with a maximum lift above the floor level to which it is bolted of 5 ft. The standard type derrick, equipped with a 50-ft. cable, weighs 285 lb. The drum is capable of holding 300 ft. of cable. All parts are interchangeable.

Hampden Floor Marking Machine

A machine that will mark floors with paint, at a speed as fast as a man walks, for aisles, safety zones and spaces where material is to be piled on factory floors, has recently been placed on the market by the Hampden Supply Co., 45 Sharon St., Springfield, Mass. It is claimed that the machine, which is illustrated herewith, will mark close to posts, machines or side walls.

The frame is made of one piece of 1¼-in. angle iron, is 10 x 20 in. in size and is mounted on 5-in. malleable iron wheels which have clincher grip rubber tires. The paint container has a capacity of 6 quarts. A hand lever controls the flow of paint, and when the flow is once set for a desired rate of feed, the paint flows automatically at that speed.

The marking pad can be furnished in any width desired, but the standard equipment is usually furnished with a pad for painting 2-in lines. The four wheels are lined up rigidly so that the machine will follow a straight line while being pushed. The total weight of the machine is about 50 lb. Machines can be supplied for marking curves and circles.

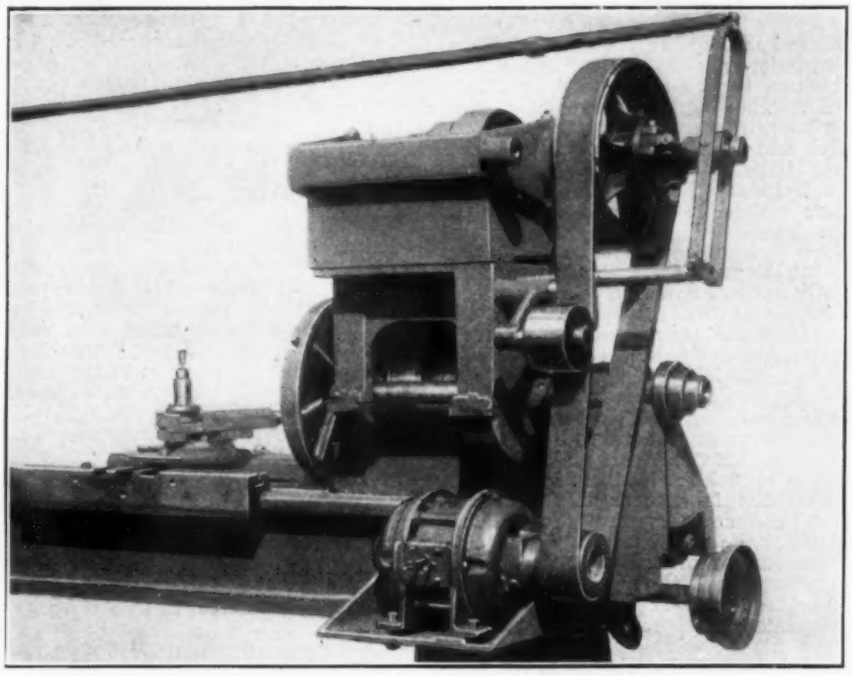


HAMPDEN FLOOR MARKING MACHINE

Steptoe Motor Drive for Cone Headstock Lathes

In order to meet the demand for a motor-driven lathe, the John Steptoe Co., Cincinnati, Ohio, has recently developed a compact motor-drive arrangement which is applicable to its "Standard" 14, 16, 18, and 20 in. engine lathes described on page 32, Vol. 57, of the *American Machinist*. This arrangement can be readily attached to the lathes as very little machine work is required, with the exception of drilling and tapping a few bolt holes.

As shown in the accompanying illustration, the countershaft unit is bolted right over the cone pulley of the lathe, and it is provided with a clutch gear so that the motor can be engaged and disengaged at will. The cone pulley on this countershaft unit can be moved away from the lathe spindle to permit the belt running from the countershaft cone pulley to the headstock cone pulley to be tightened. The belt from the motor to the countershaft is kept tight by means of an idler pulley.



STEPTOE MOTOR DRIVE ON CONE HEADSTOCK LATHE

The motor is placed in back of the lathe, in line with the bed, and is so placed as to reduce vibration to a minimum. A constant-speed motor of 1,100 to 1,200 r.p.m. is recommended.

Business Stability Is Country's Need

American business has been sufficiently interfered with; raised to the highest optimism and then precipitately thrown into the depths of despair, according to E. W. McCullough of the United States Chamber of Commerce. This mad cavorting, this frenzied galloping from one extreme to another, is neither good for business nor good for the consumer on whose prosperity the success of the business depends.

Business recovery is at hand and with it comes the desire for some measure of certainty, for business stability, for quiet and healthy development and growth, that business prosperity may be reasonably prolonged and business crises may be postponed.

News Section

Cincinnati Buying Shows Less Activity

There has been somewhat of a falling off in orders among the Cincinnati machine tool houses during the past two weeks. The improvement which had been brought about in conditions during March and the early part of April had given impetus to the machine tool manufacturers in this city and the orders which were placed with them were gratifying. The decrease in orders of late is probably due to the fact that purchasers bought rather heavily and are now in a position where their present needs are taken care of. The number of inquiries being received from day to day has held up in volume, although the larger manufacturers report that they are spotty.

Whether or not the decrease in orders is only temporary is hard to tell. Many of the machine tool companies believe that the outlook for business in the next few months is encouraging. On the other hand some express the opinion that what the immediate future brings in the way of orders is dependent to a great extent on the needs of the automotive industry. If the production of automobiles continues with but little abatement, the volume of business done during March and early April will be again attained if not exceeded in the coming two months. If there is a slackening in the output of automobiles, the production of Cincinnati machine tool concerns will be affected and they will be more quiet throughout the Summer than they have been in the last ten to twelve weeks.

Those buyers who are now placing their orders are demanding immediate delivery, which in most cases cannot be complied with as rapidly as the buyer desires. The labor situation is causing some concern and some of the machine tool houses can take on skilled help when they can get hold of the right kind of men.

The foundries are showing gradual improvement, some of them having used up their surplus stock with the result that purchases are more frequent. Plants turning out sheet metal and structural iron work are operating full capacity. The pig iron market is somewhat quiet and buying is confined to actual needs, although furnace stocks are said to be low.

Foundry Fire Causes Big Damage

The foundry of the Hill & Griffith Co., Cincinnati, was destroyed by fire on May 11 causing a loss estimated at $100,000. The belief is that the fire started from an overheated pipe of a facing machine. The fire, which threatened the plants of the Ansonia Cooper & Iron Co. and the S. Obermayer Co., is the second experienced by the Hill & Griffith Co. within the last month. The company's plant at 1246-1262 State Ave., Cincinnati, was destroyed by fire of undetermined origin April 17 last. Loss from this fire was estimated to be $150,000. The fire on May 11, which occurred shortly after the company had moved into the plant, has thrown the company's entire force out of employment temporarily.

Fatigue of Metals Causes Large Losses

Fatigue of metals has caused an estimated loss of millions of dollars annually to American industry, according to a report to Engineering Foundation and the National Research Council by Prof. H. F. Moore, who has been conducting an investigation at the Materials Testing Laboratory in the University of Illinois. Chiefly, stated Prof. Moore, losses are caused not by spectacular disasters, but by large numbers of minor accidents. Idle machinery is described as a principal item of cost.

Dealing with economies possible of accomplishment as a result of the investigation, which has been in progress more than three years, Prof. Moore says that losses might be cut fifty per cent.

Active Locomotives Are Increased

There were more serviceable locomotives on hand May 1 than at any previous date since 1920, according to reports filed with the Car Service Division of the American Railway Association, which showed as of May 1 a total of 50,259 engines in good repair. This was an increase of 152 over the total number as of April.

Locomotives awaiting repair on May 1 totaled 14,131, or 22 per cent of the total on line. This was a decrease of 719 since April 15, at which time the total was 14,850, or 23 per cent.

New Capital in Zeigler Company

The plant of the Zeigler Manufacturing Co. of Alexandria, Ind., die stamp and machine tool produce manufacturers, has been bought from Joseph Zeigler of Anderson, Ind., by a group of Terre Haute, Indianapolis and Wheeling, W. Va., business men.

The deal, which is just being completed, involves $250,000. The plant is being taken over by the Zeigler Manufacturing Co.

At a meeting of the new stockholders of the Zeigler Manufacturing Co. in Terre Haute, May 8, a board of directors was elected. Its members are: Henry K. Dalzell, secretary and a director of the Columbian Enameling & Stamping Co.; Andrew Nelson, general superintendent of the Columbian Enameling & Stamping Co., and W. J. Freeman, coal operator, all of Terre Haute; A. W. Paull, manufacturer of Wheeling, W. Va., and Fred Millis, president of the Millis Advertising Co. of Indianapolis.

Engineers Preparing for Montreal Meeting

Engineers of the United States and Canada will come together in Montreal, May 28-31, at the Spring meeting of the American Society of Mechanical Engineers, planned as the principal engineering gathering of the year. A series of forums, embracing power, textiles, port development, management, flying, railroads, fuel and international relations, will be held, as announced from the national headquarters of the society in this city.

Engineers, educators, economists and technologists, representing industrial enterprises, universities and governmental activities of both countries, will participate in the sessions, which begin at 9:30 a.m. on Monday, May 28, with a meeting of the society's council, presided over by President John L. Harrington of Kansas City, Mo.

In the afternoon there will be a business meeting, at which Calvin W. Rice of New York, secretary of the society, will deliver an address on "Pan-American Relations," outlining engineering progress in the Americas and the advance in South America of North American co-operative influence as illustrated by the growing adoption of Secretary Hoover's standardization plans. On Monday evening there will be a joint dinner of the Council of the Engineering Institute of Canada and the Council of the American Society of Mechanical Engineers.

Fellowships Are Offered to Recent Graduates

Six college graduates will be employed by Carnegie Institute of Technology next year to continue the coal-mine research and investigations instituted two years ago. Each of the six will be ranked as a Research Fellow to operate under the supervision of the U. S. Bureau of Mines, and in co-operation with an advisory board of coal-mine operators and engineers.

An announcement soliciting applications for appointments offers four Fellowships in mining research and two in teaching and research. Fellowships are open to the graduates of universities and technical schools who are properly qualified to undertake research investigations. The value of each fellowship is $750 per year of ten months.

British Pig Iron Shows Good Gain

In so far as iron production is a sign of trade activity, the April returns are highly favorable. British production of pig iron last month is reported at 652,200 tons, which compares with 633,600 tons in March. The monthly average of 1922 was 408,300 tons, but in 1913 it was 855,000 tons.

The country's steel output in April was 740,000 tons, against 802,500 in March.

New York Dealers Report Railroads Buying

Sentiment as to future business and opinion as to the present seems to be equally divided in the New York district this week. Some dealers and manufacturers state that May did not open up as well as either April or March and that if business is to be kept up to the standard, an improvement must be made and made quickly. Other dealers say that business is excellent and that no let-up has been experienced as yet. Suffice it is to say that all agree that most of the buying is for replacements or additions and that there were few new shops being started.

Railroad buying seems to be a trifle more active than it has been heretofore. The Atchison is inquiring in the New York market and some purchases are reported. Several Southern railroads are looking around in the New York district for shop equipment and purchases are reported from the New York Central, Illinois Central, Atchison and Erie.

Business in used tools is steady and ahead of that of last April or May. Export business is reported good, considering the conditions in the Ruhr and improvement is looked for at most any time.

While business is not up to the pace that was set in March or the first part of April, dealers are not alarmed and feel confident that there will be a return to a steadier business than that which they have enjoyed in some little time.

Chicago Not Alarmed by Slight Slump

Buying of machine tools and kindred equipment continues in a hand to mouth fashion in Chicago and there is considerable speculation as to how much longer prosperity will continue. Quite a number of consumers have expressed their policy as being "conservatism" until September. They believe that if prosperity continues until then they will be warranted in making purchases for expansion. At present, however, they purchase only for immediate and necessary needs.

The Chicago & Eastern Illinois R.R. is making inquiry for machine tools in Chicago. The Chicago & North Western Ry. is making inquiry for 58 machine tools of various kinds and the Chicago, Burlington & Quincy is inquiring for jib cranes, trolleys and hoists for its Denver shops. The Wabash has placed orders for a journal turning axle lathe, a car wheel boring machine and a locomotive journal turning lathe. The Southern Railway has placed orders for a 90-in. driving wheel lathe, a 600-lb. hammer, and a 100-ton bushing press. The Chicago Great Western and the New York, Ontario & Western railroads have placed orders for car wheel boring machines. The New York Central has placed an order for a journal turning axle lathe. The Santa Fe inquiries total 74 machine tools.

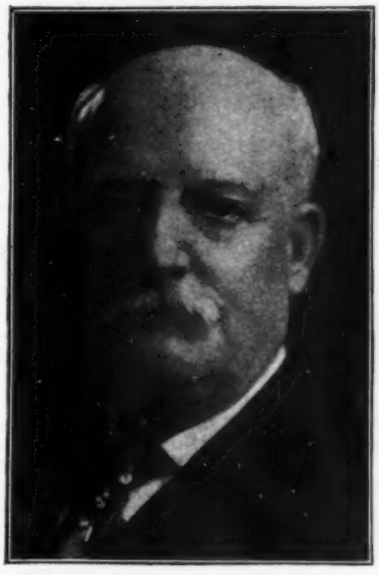
The Machinery Club of Chicago has leased the entire fourth floor of its building and plans to occupy the entire space. The club is now said to equal any in the country.

Notwithstanding the pessimistic attitude taken by some who refuse to believe such a good thing can continue or to accept the assurance of such men as Herbert Hoover that this prosperity is healthy and can continue if business will act intelligently, business is good and industry is running full speed. The present momentum bids fair to maintain these conditions for some time. Forward business is slackening somewhat but not to an alarming extent. It is evident that gloomy prognostications of the future have been considerably overdone.

Charles Sheldon, Veteran Manufacturer, Dies

Charles Sheldon, aged 73 years, died recently at his home in Akron, Ohio. Mr. Sheldon had been connected with the Whitman & Barnes Manufacturing Co. for many years and at his death was chairman of the board of directors.

He had been a familiar figure in the machine tool industry since 1867 when



CHARLES SHELDON

in Fitchburg, Mass., he became identified with the Whitman & Miles Manufacturing Co. which some years later was consolidated with other plants and continued under the name of the Whitman & Barnes Manufacturing Co. In 1872 Mr. Sheldon was made superintendent of the Fitchburg works and in 1880 he was elected a director of the company. In 1889 he was elected treasurer and eight years later, general manager. After serving from 1898 until 1902 as vice-president he was elected president, which office he held until his retirement from active business in 1915. Since that date he had acted as chairman of the board of directors.

Mr. Sheldon had many fraternal affiliations. He is survived by his wife, his daughter and three grandchildren.

New York Licensing Is Postponed

Governor Smith has signed the bill which postpones the date of compulsory licensing of engineers in New York State to Aug. 1, 1923. The American Society of Mechanical Engineers has been active in promoting this legislation.

Precision Grinding Wheel Men Address Philadelphia Founders

H. A. Plusch, plant manager of the Precision Grinding Wheel Co., Philadelphia, on May 9 gave an illustrated talk before the Philadelphia Foundrymen's Association. He explained the manufacture of abrasive wheels and told of the characteristics of hard and soft and fine and coarse wheels, indicating how they should be used. Mr. Plusch was assisted by S. M. Hershey, of the same company, who cited examples of savings made by using wheels of proper grit and grade and by buying wheels for what they could produce, not for their length of life. The two talks were strictly practical and gave worth-while insight into the abrasive wheel industry.

In the spirit of helpfulness associated with the Philadelphia Association, six members told, for the benefit of those who had not gone to Cleveland, of the Foundry Convention just concluded. A number of slides had been prepared to show the auditorium, the arrangement of the exhibit as a whole, and some of the individual exhibits.

The meeting was preceded by a dinner of planked Delaware river shad.

Metal-Working Machinery Exports

Exports of metal-working machinery in March were valued at $953,083. While this is a slight increase over the value of exports in February, it still is under the total for March of 1922. Figures just made available by the Department of Commerce show the details of March exports together with the revised figures for March, 1922.

	March, 1922	March, 1923
Lathes	$106,519	$57,728
Boring and drilling machines	51,097	47,543
Planers, shapers and slotters	19,844	10,786
Bending and power presses	13,511	7,850
Gear Cutters	1,278	11,199
Milling Machines	25,817	32,474
Thread cutting and screw machines	19,368	39,991
Punching and shearing machines	9,171	7,724
Power hammers	10,477	24,791
Rolling machines	7,067	4,038
Sharpening and grinding machines	56,584	101,072
Chucks, centering, lathe, drill and other	20,614	20,847
Reamers, cutters, drills and other parts for machine tools	151,009	165,491
Pneumatic portable tools	23,641	49,766
Foundry and molding machinery	97,044	43,314
Other metal-working machinery and parts of	440,256	328,469
Total metal-working machinery	$1,053,297	$953,083

Austrians Busy Making Locomotives

Recent orders for locomotives from Yugoslavia, Rumania, and Hungary, in addition to those of the Austrian State Railways, are sufficient to keep the Austrian locomotive factories busy for some time, according to the *Neues Wiener Journal.*

The Austrian Government has ordered seventeen electric locomotives for the Arlberg and Salzkammergut Railways. The Italian State Railways have placed an order in Austria for 200 locomotives to be delivered within three years. The *Neue Freie Presse* reports this to be the first order of Italian State Railways placed outside of Italy.

Important Accomplishments Mark Annual Meeting of United States Chamber of Commerce

Many group meetings held and able speeches delivered by eminent business men of the country—All sessions reflect unanimity of opinion and faith in prosperity

BEFORE a large and very enthusiastic gathering, Lewis E. Pierson, president of the Merchants Association of New York, opened the 11th Annual Meeting of the United States Chamber of Commerce with an address of welcome. The sessions lasted three days. After the usual business was disposed of at the opening session Julius H. Barnes, president, delivered the annual address.

In beginning his talk Mr. Barnes said: "At this milestone of progress in American business development there are certain clearly defined aspects that challenge our most sober consideration. Measured by comparison with the datum points of the past, the conviction is one of extraordinary growth and expansion in the processes of trade and commerce. The next conviction is that this expansion proceeds at a constantly accelerated pace, largely because of the service of science and invention and their mechanical aids to human effort. There follows the conviction that by this constant enlargement of the output of human effort there is a steady increase in the average earning, spending, and saving capacity of our people.

"If these trends are natural, and permanent in character, there follows the necessity for a re-survey of the datum points of trade and commerce, in order that there may be, without recklessness, a general appreciation of this quickening and swelling of trade currents, and the courage and vision to steer safely and securely a course upon these swelling tides. There must be a readjustment of the measures of comparison in order that sound and normal and natural increase of production and of distribution may be visioned and prepared for."

Interesting Comparable Figures

He pointed out that, whereas it took 40 years—from 1850 to 1890—to double the average annual earnings in this country, the succeeding 30 years—from 1890 to 1920—trebbled that earning power; that between the census points of 1900 and 1920 our population increased 40 per cent, the volume of food production increased 30 per cent, the volume of mines production increased 128 per cent, and the volume of factory production increased 95 per cent. These figures show that with 40 per cent more of population there were produced articles of human use of double the quantity produced in 1900.

Mr. Barnes also summarized the conclusions of the American Delegation of the Chamber of Commerce that sailed in February for a preliminary study of conditions in the foreign countries of Europe and for conference at Rome under the auspices of the International Chamber of Commerce for consideration of steps to aid European recovery from its after-war depression. The countries included in this summary were: Egypt, Palestine, Turkey, Greece, Algiers, Italy, Austria, Czecho-Slovakia, Poland, Germany, France, Great Britain and Russia.

In a plea for co-operation of business men of the United States and Japan, Raita Fujiyama, president of the National Federation of Chambers of Commerce of Japan, said: "America and Japan stand today as the only two great nations not threatened with chaos and disorder, not demoralized with internal dissension nor menaced by outward peril.

Japan and Europe

"Europe is in such condition that her best statesmen fear she is in danger of losing her hold upon civilization. There are still wars and rumors of wars, and they seem unable to cope with their problems.

"The responsibilities of the world have always devolved upon those able to meet them, and at this time the future of humanity is largely in the hands of your country and mine. World peace, world prosperity and world progress depend upon how well we may be able to bring ourselves into a mutual understanding and co-operation."

In referring to the relations between Japan and China he said: "Our intentions toward China are to establish a policy, not of aggression, but of economic co-operation. Unfortunately, this has not been well understood in America. With the close of the late war there appeared on the scene in rapid succession the questions of Shantung, of Yap and of Eastern Siberia. The people of Japan and America then became rather unpleasantly conscious of each other's existence; and for a short time a darksome cloud passed over our old time kindly relations.

"But the Washington Conference did not fail to find the practical working way for us to settle all matters over which we were at variance. We may now look confidently forward to establishing a peaceful co-operation in commerce and industry as a basis for the world peace which we so much desire."

The general session was followed by group luncheon meetings devoted to the subjects: Civic Development, Domestic Distribution, Fabricated Production, Finance, and Transportation and Communication.

At the luncheon held by the Civic Development Division, R. Goodwyn Rhett presided. J. W. O'Leary of Chicago, chairman of the Immigration Committee, presented his report that went to the board of directors on Feb. 8, 1923. The following recommendations were included in the report:

1. That the present 3 per cent limitation be retained as at present.

2. That to this 3 per cent be added 2 per cent upon a selective basis, making a possible 5 per cent in all. This additional 2 per cent will give us opportunity to test the practicability of proposals for selection, so meeting the desires of those who wish a selective basis to replace the restrictive, while not affording ground for alarm to those who fear an inundation.

In conclusion the report said: "Your committee would emphasize the belief that any constructive proposals dealing with a matter of such vital and continuing importance as immigration, must be based upon consideration of the best interests of the country as a whole, not upon the benefits that may accrue to any group, whether manufacturers, farmers, laborers or other. Further it must be based upon consideration of the immigrant himself. He and his family are potential citizens and the impressions made from the first contacts with our representatives abroad or our immigration officials at American ports, all are important as affecting Americanization. Any lasting solution of the immigration problem can come only as a result of an approach constructive in spirit and free from prejudice or narrow self interest."

The next speaker was the Hon. Albert Johnson, chairman of the Committee on Immigration of the House of Representatives. Mr. Johnson said that as a result of an investigation made by his committee it was shown that the skilled laborer who was able to hold a job that gave him a comfortable living was at least five times as apt to become naturalized as the common laborer who formed a part of the floating population. His studies further showed that, contrary to the usual opinion, there was no appreciable difference in the number of citizens naturalized from among the "old" immigration group as compared with the "new" immigrants. Another big factor entering into naturalization was that of dissatisfaction with conditions in the old country.

"More Producers and Fewer Peddlers"

Harvey J. Sconce of the National Farm Bureau said that what this country needs is, "more producers and fewer peddlers among her immigrants." People of this type rush in during the early months of the fiscal year filling the quota and thus barring out desirable immigrants who might want to come in later. He urged selection on the other side and said that, "what we want here is the skim and not the scum of the emigration from Europe."

The session on domestic distribution was occupied chiefly in considering the subjects of pool-car shipments and store-door delivery. W. Lee Cotter of the Cotter Warehouse, Mansfield, Ohio,

stated that "pool-car shipments, if properly handled, will help to relieve credit tension, increase turn-over, lessen transportation cost and aid production and sales, as well as relieve our transportation facilities of a vast amount of freight handling and terminal congestion." The proper co-operation in this respect between the shippers and the railroads is of great importance, and would enable a material reduction in the cost of distribution.

W. J. L. Banham, traffic manager of the Otis Elevator Co., New York City, gave a comprehensive address on the subject of store-door delivery, which he heartily approved. He believed that the system has been proved successful by the results obtained in Canada and England and that it is the only immediate and practicable remedy for the congestion of terminals that now exists. The advantage of a system of delivery handled by the railroads from their terminals would be, said Mr. Banham, that it would keep the freight moving and prevent congestion at the handling points, which congestion is at present proving so detrimental to the effectiveness of the distributing equipment. With a system of store-door delivery our present terminals would be entirely adequate to handle the freight properly. In addition, expense would be greatly reduced and delivery made much more rapidly. In conclusion, Mr. Banham urged education of the shipping public and the railroad executives on the merits of the store-door delivery plan.

Freight Rates

A. J. Brosseau presided at the meeting of the Fabricated Production group. Robert S. Binkerd spoke on the effect of freight rates on production and manufacture costs and Frederick W. Kelley, president of the Helderberg Cement Co., spoke on the voluntary setting up of quality standards in commodity production. Mr. Kelley explained that the Portland Cement Association, working in conjunction with the American Society for Testing Materials and the American Engineering Standards Committee, adopted quality standards for cement, an action that has resulted in protecting the consumer and doing away with the wasteful custom of issuing specifications for each job.

The discussion that followed Mr. Kelley's paper produced evidence that the group as a whole was extremely interested in the subject of standardization and has learned by experience of the advantages that always accompany it. It was stated that competition is just as keen when working to a quality standard as formerly and that low costs must be obtained by successful buying and management.

Carl F. Dietz, president of the Bridgeport Brass Co., in his address "Employee Education in Fundamental Economics—How to Tell the Story," showed how he illustrates by means of blocks the conduct of his business. The employees are told what enters into the cost of producing the goods and are shown how wage rates, cost of living and sales receipts vary from year to year and how they compare with each other. The varicolored wooden blocks used in this demonstration tell the story very plainly and very accurately. Mr. Dietz convinced his audience of the value of his plan and interested them greatly in his attempts to combat labor troubles by passing along a knowledge of the business to all of the employees.

The group meeting that considered finance was in charge of Lewis E. Pierson, chairman of the board of the Irving Bank-Columbia Trust Co. of New York City. Merten L. Corey, a member of the Federal Farm Loan Board was the first speaker and concisely outlined the establishment of Intermediary Banks and the powers that they will have through their charters. He declared that these banks and the rights that have been given them would be the salvation of the farmers of the Middlewest.

But an entirely different view was taken by H. Parker Willis, Editor of the *Journal of Commerce* and ex-secretary of the Federal Reserve Board, who was the next speaker. He was no less emphatic in stating that the establishment of this system would be the ruination of the farmer and extremely disastrous to business men in every part of the country.

Pierpont V. Davis, vice-president of the National City Co., New York City, spoke on the situation of the railroads and the financing of carriers within the past ten years. He pointed out that this year the roads would earn the best profits since 1917, but also stated that it was a hard matter to sell bonds due to the government tax on these types of securities as against the tax exempt securities that bear even larger interest rates.

Carl R. Gray, president of the Union Pacific System, presided at the meeting of the Transportation and Communication Group.

On the evening of the first day Hon. Herbert Hoover addressed the members in general session on the subject, "Holding on to Prosperity." His paper will be printed in full in next week's issue.

At the same session Brig. Gen. Frank T. Hines made a plea for employers to give employment to rehabilitated veterans.

Another Busy Day

The second day was begun with a general session on the topic, "Developing the National System of Railways, Waterways and Highways Transportation." Hon. C. A. Newton spoke on the co-ordination of our systems of transportation. He said, "The greatest problem before the American public today is the problem of transportation. Our commerce will be retarded, our resources, capable of yielding incalculable wealth, will lie dormant unless adequate facilities for transportation are afforded. The crying need of the country is larger facilities for transportation; facilities able to meet the demands of commerce and capable of rendering a cheaper service.

"The traveling and shipping public are not interested in railways, or waterways, highways, as such. The thing that they are interested in is a system of transportation, capable of meeting the needs of commerce at the cheapest price obtainable, and that system of transportation ought to be made up of railways, waterways and highways, not contending, but co-ordinated and co-operating."

Roy D. Chapin, chairman of the Board of the Hudson Motor Car Co., spoke on co-operation between motor and railroad, and Charles H. Markham, president of the Illinois Central Railroad Co., spoke of the co-ordination of railways, waterways and highways. Mr. Markham pointed out that, "Since there never is for any considerable time actual competition between water and rail carriers or between highway and rail carriers—as one or the other, when they are pitted against each other, takes practically all of the business—our national transportation policy should be, not to foster competition between one means of transportation and another, but to foster a co-ordinated development that will enable all means of transportation to work together to give all sections of the country the best, most adequate and cheapest service possible. Such a policy would avoid the wasteful mistakes of the past and promote the sound development of a national system of transportation. That is what we should be working for."

He also said, "More than any other human agency, the railroads have made possible the development of our civilization. It remains for us, who are the beneficiaries of this legacy from another generation, to safeguard and transmit to prosperity an unimpaired, efficient railway system that will prove capable of the tasks expected of it in the future.

Group Luncheon Meetings

The group luncheon meetings of the second day sessions were devoted to: Foreign Commerce, Insurance, National Resources and Production and Transportation and Communication. Among those who spoke at the Foreign Commerce meeting was J. Walter Drake, chairman of the board of the Motor Car Corp., whose subject was "Manufacturers in the Export Trade." Mr. Drake stated that we must maintain high standards of product and specified the following fundamental principles which apply to the export of American manufactures. Mass production permits competitive prices. Personal contact is needed with foreign selling agencies. World markets are essential to balance domestic commerce. The new tariff allows for prompt adjustment with nations which are favorable to us. The success of any American industry abroad adds to the prestige of the others. Accordingly, all business has in foreign trade a common cause.

At the meeting of the transportation group progress reports were given by the chairmen of five committees into which the transportation conference is divided.

It was the opinion of all the speakers that the railroads were in need of the support of the members of the convention, civic organizations and the public in general in order to restore them to a profitable position in American industry. This was also the belief of the delegates present who unanimously adopted a resolution to the effect that the Chamber of Commerce of the United States urge upon its members and civic organizations and the public in general a united effort

to quickly restore our great arteries of commerce, the railroads, to the forefront of American business. The group tabled a resolution calling for another referendum of the members of the Chamber on the proposed consolidation of the railroads of the country into a comparatively great system.

Regarding government ownership, George A. Post, president, Geo. A. Post Co., Inc., and chairman of the committee on Government Relations to Transportation, stated that his committee is against it. Railroad consolidations were favored by the committee headed by Carl R. Gray, president of the Union Pacific System. It was the committee's belief that consolidation would lead to economies of administration and operation and have an influence on the system of rate making. Another obvious advantage of consolidations is connected with car interchange and car supply; first, because purchases can be made from a larger viewpoint and with greater financial opportunities, and at the same time without losing the benefits of competition between systems in developing the best type of rolling stock, and second, because internal relocation of cars on systems will be facilitated.

Committee Reports

The report of the committee on the Relation of Highways and Motor Transport to other Transportation Agencies given by the chairman A. H. Swayne, General Motors Co., stressed the belief that long hauls should be left to the railroads and short ones to the motor vehicles. If this policy were carried out railroad terminals could be moved further away from congested areas, leaving the delivery to motor service. This latter practice would lead to better service, lessened costs to manufacturers and lessened congestion of city streets.

The chairmen of the other two committees, F. A. Delano, of the Committee on the Readjustment of Relative Freight Rate Schedules and W. L. Clause, chairman of the board, Pittsburgh Plate Glass Co., of the Committee on Development of Waterways and Co-ordination of Rail and Waterway Service, reported they had a mass of data before them which they were not as yet ready to report on definitely.

The Taxation group meeting was held Wednesday afternoon and in the evening an informal dinner of the American Trade Association Executives was addressed by Col. Nelson B. Gaskill, a member of the Federal Trade Commission. This was followed by a special entertainment at the Hippodrome Theater.

Thursday morning's session was devoted to various transportation problems, the first paper being by O. E. Bradfute, president of the American Farm Bureau Federation. He pointed out the interlocking interests of both farm and city in such fundamental necessities as food and clothing. The farmer's transportation problem begins with his own wagons or trucks and ends, according to Mr. Bradfute, only at the center where it is consumed.

Financial Support for the railroads was the subject of an address by W. N. Doak, senior vice-president, Brotherhood of Railroad Trainmen, who pointed out that labor's interest in adequate financial support must be apparent in spite of the fact that labor was frequently misunderstood and placed in an awkward position on this subject.

"We are," he said, "so much interested in the welfare transportation of our industry that we are coming to you with an appeal for business justice. Let us learn to live and let live by treating the railroads fairly, by being fair to capital, fair to labor and by being fair to ourselves. Let us not be deceived into the belief that we can starve the railroads, speculate in them to a dangerous degree, wreck their credits, pay inadequate wages to management and employees and expect a healthy transportation system."

Walter W. Head, first vice-president of the American Bankers Association, who spoke on the re-establishment of Railroad Credit, pointed out that this involves the entire problem of the permanent restoration of a vital force, capable of meeting the traffic needs of the country. It also means that the railroads must meet the demands of shippers, of labor and of the investors, on a basis which is fair to all. In spite of the fact that we have felt the burden of general depression, the railroads report the heaviest traffic in their history for the 37 weeks ending March 17, 1923. Existing facilities were taxed as never before, which leads to the question of how a fully revived business can be handled, he stated.

At the afternoon session the Chamber declared in favor of a general international economic conference and the World Court of Justice.

Resolutions also were adopted favoring the loosening of immigration restrictions by adding a selective 2 per cent to the present 3 per cent restrictive quota; expressing confidence in a solution of the railroad problem; expressing belief that the State should continue to regulate public utilities instead of delegating its power to local authorities, and favoring the private operation of Government-owned ships, the improvement of waterways, development of a system of flood control and the reclamation of waste land.

Some of the Sentiments

The convention declared in favor of a court of tax appeals, but refused to adopt the recommendations of the taxation group for a declaration in favor of changes in the present Federal tax laws, providing for a reduction in the maximum surtax from 50 to 25 per cent; for a general sales tax of one-half of 1 per cent, and that capital gains and losses should not be recognized for income tax purposes. An amendment to adopt the taxation group's recommendations was tabled, after it was explained that the chamber had just appointed a Taxation Committee and that it seemed more advisable to the Committee on Resolutions not to commit the chamber on these points without further study.

Comparing the French occupation of the Ruhr to the collection of a debt by means of a Sheriff, Robert Masson, Director General of the Credit Lyonnais of Paris, told the delegates Thursday night at the Hippodrome that the great need of France was for new money. He asserted that France had received practically nothing from Germany in reparations payments and had expended 85,000,000,000 francs for the material and personal damages sustained during the war.

Mr. Masson said that, if the reconstruction work of France were completed, she would be able to balance her budget, the strain on the money market would disappear and capital would be available for new enterprises. Telling in detail just what France had done in a financial way since the war, he expressed hope for the assistance of the United States and belief that entire aloofness would not be its policy.

International President Speaks

Willis H. Booth, president of the International Chamber of Commerce and vice-president of the Guaranty Trust Co., said that the committee appointed by the recent congress of the International Chamber at Rome to carry out its resolution calling for an international economic conference, realized that the time when it might become of practical assistance was more or less controlled by the relations between Germany and the Allies and that nothing of a premature character should be done that would jeopardize proper ultimate adjustment.

Homer L. Ferguson, president of the Newport News Shipbuilding Co., a former president of the Chamber, urged the business men to be more frank in voicing their opinion on political issues. He referred to the recent attack upon Elbert H. Gary by Senator Brookhart of Iowa as an unwarranted attack upon a representative business man.

The convention closed Friday with a trip to West Point.

Railroad Earnings are Increased

Net railway operating income of the Class 1 roads during March was $83,568,000, according to figures given out recently by the American Railway Association. For the same month last year the figure was $83,487,000. On the basis of return on an annual basis as allowed on the tentative valuation of railroad properties, the March, 1923, showed earnings at rate of 5.84 per cent as against 5.96 per cent the previous March, to use the calculations of the American Railway Association, and against 5.83 per cent for the previous March, as computed by the Bureau of Railway Economics. The difference in earning ratio rests in the fact that the tentative valuation figure has not been definitely fixed and during the past year the roads have increased their value by many millions through purchase of new equipment and the building of new lines, additions, extensions and other improvements.

The March, 1923, figure shows a sharp increase over earnings for last February when the total was $38,903,000, or 3.73 per cent. As compared with the previous March, the month's operating revenues increased 13 per cent to $535,541,000 and operating expenses increased 15¾ per cent to $417,913,000. For the first quarter the roads earned a return of 5.13 per cent on their tentative valuation. During this period, it was pointed out, there were many operating difficulties because of weather handicaps and with the turn of the second quarter there was reported a substantial improvement in equipment and road bed conditions, while traffic was decidedly on the upturn.

Machine Tool Builders Hold Annual Meeting

White Sulphur Springs, West Virginia, scene of yearly convention of Association—Variety of subjects discussed and improvements suggested—Attendance excellent

THE SPRING convention of the National Machine Tool Builders' Association was held at the Hotel Greenbrier, White Sulphur Springs, W. Va., on May 9, 10 and 11. On the opening day the morning was spent listening to the usual reports of officers and committees.

J. Wallace Carrel, chairman of the committee on co-operation with the Department of Commerce, urged the members to make full use of the facilities of the Industrial Machinery Division and to co-operate with the Division of Simplified Practice to the fullest extent.

The afternoon session on Wednesday and the sessions on Thursday were devoted to round table discussion on administrative, sales and association activities. A banquet was enjoyed on Wednesday evening after which Dean Dexter S. Kimball, College of Engineering, Cornell University, delivered a lantern slide address on "Machine Tools: The Master Tools of Industry."

The Thursday evening speaker was C. A. Plaskett, acting in charge of container investigations, U. S. Forest Products Laboratory, Madison, Wis. His subject was, "Making Better and Cheaper Containers for Both Foreign and Domestic Shipment."

The final day of the convention was devoted to the usual divisional committee meetings.

President E. J. Kearney delivered a masterful speech that was well appreciated by the attending members of the association. Ernest Du Brul also spoke with his characteristic clarity and divulged many interesting facts about the industry. Enthusiasm was manifest at all of the sessions.

Excellent Logic Characterizes Kearney's Address to Machine Tool Builders

WHEN WE were last assembled, it was in the heart of the Berkshire Hills. The brilliant colors of autumn were spread over the hills and valleys in a manner no artist except Dame Nature herself could reproduce. The paths over the wooded hills, the drives leading through historic villages past famous estates, and golf courses, furnished means for recreation, visiting with old friends, and the making of new ones. The weather was ideal in every respect. No convention in the history of the Association brought forth more practical ideas for the good of the industry, and no convention has thus far been held in which the members generally seemed to be better satisfied with results.

We are assembled again at the opposite season of the year, in another state, and in a different clime. The red, yellow, and orange has given place to green. The flowers which then awaited the belated frost now prophesy fruit and an abundant harvest.

The tantalizing inquiry which indicated an awakening interest in the equipment buyer, and which produced a total selling expense sufficient to make the purchase, has matured into an order. From somewhere in Ohio or Massachusetts, if the radio set were tuned in, we would hear the squeak of a planer belt as the platen moves to and fro, making the order ready for shipment. The superintendent, and possibly the boss himself, is out among the house-painters and truck drivers, going through all the highways and byways of employment looking for the lost lathe hands and fitters, to complete the job. The fire is lighted under the boiler once more—burning expensive coal — burning faintly perhaps — but burning just the same. Oh, the joy of that dusky cloud as it hovers over the top of the chimney or floats away on the breeze.

The questions we should ask ourselves today are these: First — Have we learned anything from the long period of idleness? Second—What steps can be taken in preparation for the next depression?

I shall not attempt to make a catalog of all the lessons that have been learned, or of all the defenses that should be set up against the evil day when machine tools again become a non-salable article. But references to a few may serve to stimulate thought, provoke discussion, and be the means of bringing out the answers.

When the war came to a sudden and unexpected end, we were seriously concerned as to how our individual organizations could be held together, inventories liquidated, and our finances put in shape to withstand a period of heavy selling of machines used by government and private shops in the production of war material. Some of the most experienced and ablest men in our industry, believing that there would be a drop in the cost of production, made immediate and drastic cuts in prices. One such man told me that he felt that he owed this to his employees, and had hoped that by making a substantial reduction he could thereby keep his shop running. Then, before anyone knew what was happening, we were carried off our feet by the post-war boom. By this we saw that war was not necessary to stimulate demand. Foreign and domestic dealers vied with each other in placing stock orders, and actual purchases by users seemed to justify their optimism. When the real slump came, it stole in unawares. There had been no co-operative compiling of statistics to show the rate at which the demand was decreasing, and maximum production went merrily on until there was an unprecedented inventory accumulated at high prices, and finished machines, regardless of their merit, could not be sold at any price.

May not the following be considered as axiomatic in answer to the first question—have we learned anything from the long period of idleness?

Six Axioms

First—The demand for machine tools is subject to the greatest fluctuations, even greater than that for the most useless luxuries.

Second—A continuous record plotted into a curve showing the fluctuations in volume of orders on a percentage basis, using any selected period as 100 per cent is of the greatest value and would have saved millions in 1920.

Third—The beginning of a period of depression is the wrong time to accumulate stock.

Fourth—Price reductions have no bearing whatever on the sales of machine tools.

Fifth—Idleness costs money, but is unavoidable from any knowledge that we now possess.

Sixth—The absence of substantial cash reserves with which to enter a long period of depression means price cutting, loss of self respect, discredit among our competitors, humiliating pressure from banks, expensive refinancing, creditors committees, or receiverships.

The Second Question

As to the second question: What steps can be taken in preparation for the next depression? The following may be mentioned:

First—Closer co-operation with dealers. A new concern, without any knowledge whatever of how to reach the user, may copy the design of an existing machine and get on the market in good times through the medium of the dealer. This is, in a large measure, responsible for the highly competitive condition and the low prices that usually prevail in our industry. This is especially true of tools that are simple in design, such, for example, as upright drills and shapers, but extends throughout the entire line, though in somewhat less degree. When the runaway demand comes, the dealer finds that if he can make delivery ahead of competition, orders can be taken for tools of less reputation, or no reputation as compared with the machines that he has been selling. Some dealers, therefore, approach a small shop, or an ambitious mechanic with offers to sell the entire output if only a start will be made. Equipment will be supplied on partial payments, the new product to be taken in lieu of cash. Thus a new competitor is launched with no knowledge of costs or prices except those supplied by the dealer out of his scanty or biased information.

It is surprising with what complacence this operation is viewed by the busy manufacturer when it means the division of sales effort with an inferior and cheaper tool, which has but one tendency when the peak is passed—

President E. J. Kearney's annual address delivered at the National Machine Tool Builders Association, White Sulphur Springs, W. Va., May 9, 1923.

fewer sales and lower prices for the high-grade product. The manufacturer who has spent years in building up sales connections should guard them jealously.

It would not be generous or in accord with public policy, to set about trying to prevent the development of new competition on the part of capable and experienced men; but there should be more co-operation with the dealer in this regard, for the practice leads not only to weaken old established concerns, but loss, disappointment and bankruptcy to the uninformed who make a start in boom times relying on promises that cannot possibly be fulfilled in times of even slight depression.

Did Not Know Business

An old friend of mine had for many years been running a successful repair shop in a small way. He came to me one day for financial advice, saying that he had broadened out his business and was now building a machine tool for which he had been promised a steady market by a well-known dealer. A little questioning brought out the fact that he was selling for not more than 60 per cent of the price at which the better tools in that line were sold. He was utterly ignorant as to the possible costs and knew nothing of prices. It is not necessary to tell you that he was headed for financial distress. He was actually there at the time and was only saved by sacrificing his entire new venture.

The manufacturer who relies on a dealer should see to it that the dealer relies on him. There should be mutual confidence and close co-operation for the good of both. This policy broadly and intelligently followed will help when the next slump comes, which I hope is some distance away.

There is another aspect of this same question that is of vital importance, and that is the abandonment of specialization in one line at the behest of some dealer who has lost out with some other manufacturer in a non-competitive line. There are some notable concerns that are making conspicuous success in manufacturing several lines of machine tools, but it will be noticed that they have in each and every case been in these lines for many decades. The successful specialist who has built up a great and honest reputation in his line may be taking on a real burden when he adds another at the request of friend dealer, as it may take years before there is a satisfactory return, and his effort adds to the difficulties of those already in.

Getting Ready for Emergency

A second way in which preparation can be made for the next depression is to get in the habit of closely following the percentage curve showing in what direction the volume of new business is going, and at the first sign of a distinct downward tendency, decrease the volume going through the factory before it is too late to prevent the accumulation of a dangerously burdensome inventory, as was done in 1920.

It is to be regretted that there are still some who are not reporting the percentage volume of new orders, and consequently not receiving the charts. It is obvious that these reports gain in value as the number reporting increases, and of course those who do not report and do not receive the charts are not getting the services out of the Association that might be had for only a little effort on their part.

There has been some question raised by a member here and there, in perfect good faith, as to the value of the percentage volume charts just referred to, and to the general information bulletin of a commercial, economic or technical nature; but a still larger number has testified voluntarily to their worth, and have encouraged further study and progress.

When Mr. DuBrul was first employed, it was expected that some of the lines of investigation undertaken would lead nowhere, and that in some things a fresh start would have to be made. He has met with noteworthy success, and is in demand to speak on economic subjects as applied to the machine tool business and has done so on several occasions, always setting forth the position of our industry—never failing to impress our viewpoint on the public addressed. He plans to improve and condense the charts and bulletins. He is energetic, honest, thoughtful, and in dead earnest. If any one on earth can give us the timely warning that we will need as the next slump approaches, it is Ernest DuBrul, but he can only do this efficiently if we do our part. We should make it important business to see that he gets our reports promptly. In this way we will get our money's worth and be thoroughly and effectively prepared for the next depression.

Preparing for Its Cost

The third item in the list of things to do in preparation for the next period of idleness is to prepare for its cost. No argument need be advanced here today, or any details given, for the reason that our experience is all too recent. The deficit is not yet wiped out. The money that has gone and the debts that have come, both testify to the cost of idleness. The phrase is now a sort of bugaboo that we shout at each other with the implied question: What can be done about it?

When business recovers and orders are coming in excess of plant capacity, machine tool builders, although they are among the steadiest and most conservative of businessmen, begin to relax their vigilance. Expenses increase, personal and business extravagance takes possession of us all. We blame the casting cleaner for putting his money into silk shirts in place of in the savings bank, while we do exactly the same thing in principle. The standard of business living goes up, and the price of mahogany office furniture increases out of all proportion. Is it not clear that overhead kept down in good times will help to keep down the cost when the orders are few? Do the best we can, there will still be taxes, insurance, and individual organizations to be saved, and a thousand expenses that cannot be avoided. Where will the money come from with which to meet these expenses when the next slump comes?

A plan was proposed, though not in complete detail, by Charles Oesterlein at the Cleveland meeting, Feb. 24, 1921, which to my mind comes nearer to a solution than anything yet offered. This plan, stated in its simplest terms, provides for the calculation of burden to be applied on the production hour basis over a number of years in place of a single year. If this plan were in use, the burden profit of the good year would be carried over into the next as a burden reserve, and so designated on the books. This reserve would be carried along from year to year until the slump came, and then be applied in the payment of the cost of idleness. If, for example, five years were taken as the period, each year a new burden rate would be calculated as a moving average of the last five.

Accountants will object to the plan because it does not fit their theory or practice. It is in effect the plan used by many banks in providing a contingent reserve for bad debts. They credit this account with a certain percent of the gross interest collected, and keep it out of the profit and loss account. If there are a number of lucky years in which there are no large losses to charge off, the bank may take something out of the contingent reserve account and credit it to undivided profits or surplus.

Cost Accounting

There are a great many angles to this system of cost accounting, that it will not be possible to discuss here, such as taxes, changes in the overhead rate per production hour due to improved tools, increased volume due to the growth of business, and many other things. There is always opportunity for hair-splitting arguments, but all will agree that something should be done.

Exactly the same principle applies to selling costs. Direct sales cost little in good years and are expensive in dull years. Selling through dealers has a tendency to average the cost, but not entirely so. Burden reserve should therefore be of two kinds—Factory and Selling.

The burden reserve accumulated in the good years would reduce the amount standing to the credit of profit, and have a tendency, when rightly viewed, to keep dividends down to a safe and wholesome basis, prevent overexpansion, and generally steady the industry in every way.

This method of accounting, if applied during the past five years by the concern with which I am connected, would have increased the apparent costs (the actual costs were the same in any case) over one-half million dollars. Would that not have been a tidy sum with which to enter a period of idleness?

Necessary to a successful application of the foregoing is the obtaining of an adequate price during the buying period. Manifestly, the first step toward obtaining an adequate price is to ask it. Buyers are not given to paying more than the asked price. In fact, they usually resort to every conceivable device in attempting to buy at a lower figure, and will continue to do so until the industry achieves sufficient dignity to present a solid front against selling at nothing less and nothing more than the printed price-lists in the hands of all dealers and salesmen.

One Price Policy

That we are tending in the direction of one price to all without discrimination there cannot be the slightest doubt. In fact, the number who still follow the old practice, either occasionally or habitually, is very small; but like many another minority, they attract much attention, which is exactly what they do not want. They are unworthy of the respect of the honest buyer, and probably seldom get it. Few buyers of moonshine have any respect for their bootlegger.

If the assumption is correct that price cutting to one customer and selling at top prices to the trusting buyer, is no longer followed by men of intelligence and common business integrity, we can devote ourselves to a consideration of the factors that enter into the making up of adequate price-lists. The selling price of machine tools depends on five principal factors:

First, usefulness to the buyer; Second, cost; Third, competition; Fourth, reputation, and Fifth, selling methods.

There is an increasing tendency among us, readily discernible if you stop to consider it, to give first place to competition in establishing the price, when in reality usefulness to the buyer and cost are the main factors.

The uses to which a machine may be put are infinite in variety. For that reason a special, and perhaps exclusive feature, is of no particular value except to a certain percentage of the buyers. Let us say, for example, 30 per cent. Fixing our eye on competition and setting the price low enough to obtain 35 per cent of the business, may result in the total elimination of profit from the 30 per cent of the cases for which our machine is best adapted.

There is a place for the light, low-priced machine where it will answer the purpose just as well, perhaps better than a heavy one of higher price. The heavy machine in striving to compete, throws away its profit on all sales, including those for which it is best adapted, by attempting to enter a field where it would not be found except as an incident, being used in part on work for which the light machine is ill-fitted.

Non-Competitive Machines

The same principle applies to highly developed, as against simple machines; also, the machines of high accuracy and finish as compared with those in which these features are absent.

It is not possible for one shop to build all classes of machines in a given line, as, for example, heavy and light, highly developed and simple, accurate and inaccurate, for the reason that such a mixture could not be manufactured with the same shop personnel, and the concern attempting such a program would have a reputation based on its low grade product only, and, therefore, would have much difficulty in marketing the higher grades. This is no deflection on the makers of less accurate machines. They have their field, but the maker of the accurate product should not attempt to reach the price of the inaccurate, nor is it necessary for him to enter any such competition.

There will always be honest misrepresentation in selling practice, for the reason that the maker of the less accurate machine does not, as a rule, fully understand the difference. The user is the ultimate judge and every maker will have a clientele. The field to which different classes of machines apply overlap each other, it is true, but making an attempt to establish a price for the higher grade, or heavier and more powerful, so that it will compete in the lower half of the field, is anything but wise, and results in no profit for any one. We should have the courage to measure quality, production features, and cost of a given machine, taking into account the reputation or good-will of the maker, and set the asking price to include a fair profit.

Our business is highly competitive, but fortunately price is not the only basis for competition. If we were making nails, for example, with the product of one factory exactly like the product of every other factory, there would be only one basis for competition—that of price. In machine tools, the real sport of the game is in design. The concern that brings out a new machine, or adds a few features to an old one that will increase production or improve the quality of the product over that of previous standards, is performing a public service for which it should be rewarded. Usually the reward comes, unless the designers of that concern are so prolific in ideas that they do not finish the development of one thing until they are on the next, and so never reach steady production; or do not stick long enough to production once attained to get the money back that has been expended on jigs, tools, and patterns. Overdoing design competition to the extent of making changes before a profit has been realized on the old, is just as disastrous as price competition, so far as loss of profit is concerned.

Tested Designs

The public will cheerfully pay for advanced design, that has been thoroughly tested out, and it is proper and necessary that it should be recognized as an important factor in making up the adequate price-list.

There is another subject that has been much in our minds of late, that may have a vital effect on the competition of the future, tending in the direction of price competition rather than in the direction of design and quality—that is, standardization. There are advantages both to the maker and to the user to be able to associate a given number of machine with standard ranges as furnished by all makers. In making a new design, it is a satisfaction to know that certain ranges are standard and will be followed in the new designs of competition. Some confusion, however, arises from the practice of many builders of making more than one machine of the same number, differing in all dimensions except ranges.

There is room for progress in the matter of standardization, but it must be pointed out that the nearer together machines of different makes come in their general dimensions, the nearer together they will come in price, so that in the end we find ourselves on the defensive if we ask a few dollars more than one of our competitors making a machine carrying the same number as that of our own.

There are many sides to this subject, but only one is being considered here; that is, its bearing on competitive conditions as they will be a few years hence. I prefer to see our friendly efforts to overcome placed on a higher plane than that of mere price.

Knowing Costs

From the early days of the Association down to the present, we have laid great stress on the obtaining of costs, and on two different occasions have employed experts with a view to arriving at a uniform cost system. There can be no doubt that the result of this work has been beneficial to each and every member, as it has given him a better understanding of his business.

It is considered that the primary object of cost is for the purpose of using it as the major factor in determining price. In the old days we all know that the practice was to set the price not higher than that of a competitor, assuming that if he could produce a given machine for the price at which he was selling it, we could do the same. If we are to return to the same system of price making, and I fear that there are evidences of it, we can reduce overhead by allowing one of the progressives to go to the expense of obtaining costs, and the rest of us set our prices in accordance with those established by this philanthropic competitor.

Let us build the best machines that can be made. Build them with points of real difference. Let our product, to some degree, reflect our individuality. This does not mean adding mere talking points, but does mean differences in points of practical utility. Let us also show our individuality, courage, and confidence in our product, giving less weight to competition in making up a price-list capable of providing a reserve with which to meet the next depression, and cover the cost of idleness which will then accrue.

My first contact with the machine tool industry was under the tutelage of a man of very mercurial temperament. If a nice stock order from a dealer came in one week, he went about with his eyes on the ceiling, planning how another story could be added to the plant. When the next week came, and with it no order, his eyes were on the floor while plans were being matured in his mind for reducing the working force.

Allowing for Fluctuations

Perhaps we are all to some degree just like that man, and need to have lessons in keeping our minds and judgment nearer to the average condition rather than follow with too much exactness the ups and downs of our fluctuating business.

When we meet in convention, or accidentally here and there, the topic of discussion is usually on our problems, which is perfectly natural because those things that are solved no longer give us concern. A stranger listening for the first time to our complaints would probably go away with the idea that there was no good thing about machine tools. Such, however, is far from the case. It is not a get-rich-quick route. It is something more worth while. It is the foundation of mechanical progress, and mechanical progress has been the means of adding more people to the worlds population in the last hundred years than were added during the previous million. We are in it not only for the money that can be made, but for the real joy of it. Go where you will, no industrial center will be found where manufacturing is being carried on, be it cornhuskers, printing presses, automobiles, or airplanes, that does not have among its leaders and men of affairs graduates of the machine tool shops of Hartford, Worcester, and Providence. In this respect, we are performing a really valuable service in training mechanics to go out into all the world as apostles of progress.

Is this service to humanity not a service worth striving for? Are there not other things, if we had time to catalog them, that make our industry worth while to those who follow it? Let us now and then look up and dream about adding another story to our mental workshop from which to get a wider vision of our mission of usefulness.

Personals

A. M. ANDRESEN, president of the Buffalo Machinery Sales Corp., Buffalo, who has previously devoted most of his time to the Pittsburgh office of the firm, under the firm name of the Knox-Andreson Tool Co., will now manage both offices. This company specializes in portable electric drills and woodworking machinery.

E. G. RUSS, former manager of the Buffalo Machinery Sales Corp., Buffalo, has been made manager of George Oldham Sons Pneumatic Tool Co., 60 Builders' Exchange, Buffalo.

C. A. PARNELL, branch office manager for Joseph T. Ryerson & Son, Buffalo, has been transferred to the new Ryerson plant at Cincinnati, of which he will be manager.

WILLIAM F. DUNKER, who recently severed his connection with the Stacey Manufacturing Co., Cincinnati, has organized the William F. Dunker Engineering & Sales Co. in that city. Mr. Dunker was associated with the Stacey Manufacturing Co. for twenty-three years.

L. N. BURNS, for the past year sales manager of the LaCrosse Plow Co., LaCrosse, Wis., and previously for many years vice-president and director of sales of the J. I. Case Plow Works, Racine, Wis., has acquired an interest in the O. E. Szekely Co., Moline, Ill., and becomes president and treasurer. The Moline concern designs, builds, tests and develops various kinds of machines, including tractors, automobiles, gas engines, washing machines, cream separators, etc. It was founded by O. E. SZEKELY, who has advanced from president to chairman of the board of directors. C. I. JOSEPHSON, son-in-law of Mr. Burns, is vice-president.

HARRY COLLINSON has been appointed district sales manager in charge of the Milwaukee, Wis., district for the Carborundum Co., Niagara Falls, N. Y. Mr. Collinson succeeds J. H. JACKSON, resigned.

H. VOGES, JR., has been made secretary and general manager of the Imperial Drop Forge Co., Indianapolis, Ind.

HOWARD A. ROGERS has established an office in Machinery Hall, Chicago, and will handle the Western business for the New Jersey Machine Corp., Hoboken, N. J.

FRED H. DORNER, Milwaukee, Wis., has been appointed Wisconsin representative for the Standard Turbine Corp., Wellsville, N. Y.

G. A. DAVIES, for many years sales manager of Wickes Brothers, Saginaw, Mich., has recently been appointed manager of the Los Angeles, Calif., branch of the Eccles & Smith Co., machine tools, shop supplies, and pneumatic tools.

DENNIS M. HARVEY, of East Chicago, Ind., has been named state agent for the United States Foundries and Manufacturing Co., a Delaware corporation which has qualified to do business in Indiana. A total of $50,000 of the corporation's capital stock is represented in Indiana.

W. D. CREIDER has been appointed sales manager of the Oil-Gear Co., 60 South 27th St., Milwaukee, Wis. Mr. Creider was formerly in the Milwaukee office of the Federal Machinery Sales Co., Chicago, Ill.

J. M. MACRAE has been appointed assistant manager and designing engineer for the Davis & Thompson Co., Milwaukee, Wis. Mr. Macrae was with the Ford Motor Co. eight years and has had a wide range of experience in the design of high production machinery.

JOHN LYLE HARRINGTON, president American Society of Mechanical Engineers, was the guest of honor and principal speaker at the monthly meeting on May 16 of the Engineers' Society of Milwaukee.

FREDERICK A. WAGNER, formerly works manager for the Gould Manufacturing Co., Seneca Falls, N. Y., has gone into business for himself in Rochester, N. Y., incorporated as the Frederick A. Wagner Co., Inc., manufacturer of pumps, tools and dies.

F. ARCHER THOMPSON has been appointed as representative in a sales and engineering capacity in Detroit, Mich., for the Bullard Machine Tool Co., Bridgeport, Conn. Mr. Thompson is located with the Motch & Merryweather Machinery Co.

Business Items

The Bartlett Hayward Co. announces the removal of its New York office to the Pershing Square Building, Park Ave. between 41st and 42nd Sts.

The Fay & Egan Co., Cincinnati, has practically moved its entire plant from John and Front Sts. to its new factory at Thirty-second and Robertson Sts. The firm expects to have all its employees and machines working at the new plant within the next two weeks.

Many American manufacturers of labor-saving machinery will exhibit at the Prague International Sample Fair to be held in September at Prague, Czecho-Slovakia under the auspices of the Masaryk Academy of Labor.

The M. A. Palmer Co., Boston, Mass., has been appointed the New England mill representative for the Wallingford Steel Co., Wallingford, Conn.

The West Allis Foundry Co., West Allis, Wis., has disposed of its plant and property at Seventy-fifth Ave. and Elm St. to Alfred M. Jones, head of A. M. Jones & Co., 812 Mayer Building, Milwaukee, Wis., foundry equipment and supplies. Mr. Jones was for some time sales manager of the Federal Malleable Co., West Allis. He is retaining the operating organization and will continue to manufacture gray iron, semi-steel and chilled iron castings.

The Pittsburgh office of the Link-Belt Co., Chicago, has been moved from the old quarters, 1501 Park Building to 335 Fifth Ave.

The Triplex Machine Tool Corp., New York, has appointed the Herberts Machinery & Supply Co., Los Angeles, and San Francisco, Calif., its representatives for California.

The Vanadium Alloys Steel Co. has moved its Chicago office and warehouse to 1440 West Lake St.

The Navy Department announces a sale of surplus supplies of boats, engines and boilers. The bids will be opened on June 1 at the Central Sales office, Navy Yard, Washington.

The Rockford Milling Machine Co., Rockford, Ill., has taken over the making of the Cadillac single and double-end centering and drilling machines and the Cadillac bench centers formerly manufactured by the Cadillac Machinery Co., Detroit, Mich.

Damage to the amount of $30,000 was done by fire recently at the Model Machine Works, Frankfort, Ind.

A complete reorganization of the board of directors of the Stevenson Gear Co., Indianapolis, Ind., has been effected. Five new directors were elected by the 600 stockholders of the company who attended the annual stockholders' meeting. The new directors were elected to fill vacancies caused by the resignation of B. A. Worthington, R. T. Wingo, T. B. Hassler, T. J. Stevenson and W. C. Starkey from the board earlier in the year.

The stockholders approved the production program of the company as outlined by G. E. Stevenson and G. R. Stevenson, who have been in active charge of the plant since the resignation of the five directors.

The foundry of the Taplan-Rice-Clerkin Co., Akron, Ohio, manufacturer of stoves and furnaces, was damaged by fire recently. It was practically a new plant.

The Union Electric Steel Corp., the new name of the Union Electric Steel Co., Carnegie, Pa., is planning an increase in its steel melting capacity.

Plant A of the United States Cast Iron Pipe & Foundry Co. at Scottdale, Pa., was partially destroyed by fire, at a loss of $100,000, recently. It was announced that the plant will be rebuilt immediately.

Obituary

HUGH ANNIS, 40 years old, Indianapolis, Ind., head of the Indianapolis sales department of the Milwaukee Locomotive Manufacturing Co., Milwaukee, Wis., died May 8 in a hotel at New Albany, Ind., of neuritis of the heart. He had lived in Indianapolis some time. He was a member of the Masonic order, the Knights Templar, Shrine and Consistory.

CHARLES A. GEYER, aged 58 years, died recently at South Bend, Ind. Mr. Geyer was superintendent of the machinery department of the Singer Manufacturing Co. and had been ill but a few weeks.

PORTER B. YATES, founder, president and general manager of the P. B. Yates Machine Co., formerly the Berlin Machine Works, Beloit, Wis., and Hamilton, Ont., died recently.

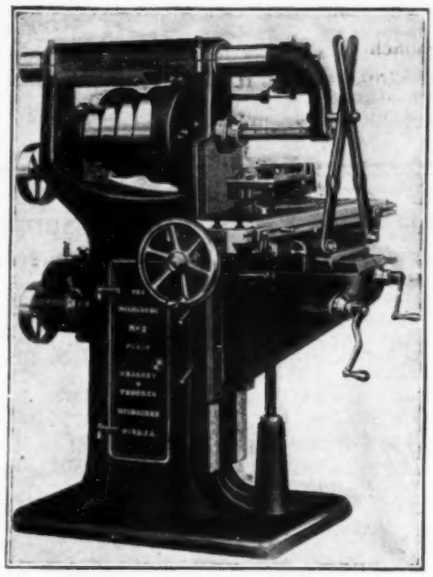
WILLIAM J. GAMBLE, treasurer and general manager of the Vulcan Steam Forging Co., Buffalo, and a former official of the Iroquois Iron Works died recently at his home in Buffalo

Kearney & Trecker Corporation Receives Congratulations on Twenty-Fifth Anniversary

JUST twenty-five years ago, on May 17, 1898, E. J. Kearney and Theodore Trecker rented the little shop shown herewith, at 271 Lake St., Milwaukee, Wis., and thus formed the well known firm of Kearney & Trecker. Both men are from the middle west, Mr. Kearney hailing from Iowa and Mr. Trecker from Illinois. The former worked his way through college by firing a locomotive, working at the job nine different times before finally obtaining his desired degree. Mr. Trecker came up through the machine shop and they came together in the plant of Frank Kempsmith in Milwaukee, in about 1894, young Kearney going into the drawing room at that time.

The two men seem to have been drawn together from the beginning, and after much discussion decided to go into business for themselves as soon as opportunity offered, which was shortly after Admiral Dewey's victory at Manilla. For the first year they built special machinery, much of it from their own designs. But their previous experience on milling machines had convinced them of their possibilities as machines for quantity production and their first milling machine was brought out in 1899 as is shown herewith. From that date they devoted all their attention to this type of machine and they have specialized in milling machines ever since.

Specialization may, in fact, be called the watchword of this firm. For when they design and put out a new machine it becomes standard and older types are abandoned. Examples of this may be found in the double over-arm, the system of flooded lubrication and the single pulley drive. Since introducing the latter, for example, the cone pulley machine has been abandoned and they were for many years the only firm building nothing but the single pulley drive.



THE FIRST KEARNEY & TRECKER MILLING MACHINE

Those who are fortunate enough to know both men can easily recognize them in the center of the group in front of the old shop in the accompanying illustration, and cannot fail to remark on how little they have changed in appearance in the quarter century that has slipped into the past since this was taken. Nor are there many firms where the two original partners are still working together after a lapse of twenty-five years. Furthermore one of the original workmen, Herman Pufahl, who stands third from the left, is still with the firm, which adds further testimony to the spirit of consideration and fair play which has always been one of the assets of the firm. The boy in the doorway is Irving Smith who is now president of the Sterling Wheelbarrow Co.

The original quarters were soon outgrown and in 1901 a shop was built just outside the city of Milwaukee in the town of West Allis where it is now located, but it has, of course, grown until it now occupies a floor space of three acres. The original shop on this site, however, is still a part of the present plant. The employees of the Kearney & Trecker Corp., have arranged a suitable celebration for the anniversary.

THE FIRST KEARNEY & TRECKER SHOP AT 271 LAKE ST., MILWAUKEE

Liberty Motors Offered by Government

The War Department announced recently that it would offer for sale immediately 900 Liberty motors.

A flat price of $2,800 for Americans and $4,000 for foreigners had been placed upon the engines, it was announced.

Will Represent Railroads in Toledo

Appointment of R. W. Edwards, former General Superintendent of Transportation of the Missouri, Kansas & Texas Railroad, to be District Manager of the Car Service Division of the American Railway Association at Toledo, Ohio, was announced recently by the Car Service Division. He assumes his duties at once.

The appointment is in line with the policy recently announced by the Car Service Division of establishing district headquarters in certain cities for the purpose of bringing about closer co-operation between shippers and carriers and to enable the railroads to anticipate as far as possible the transportation needs of the industrial and agricultural districts in various parts of the country.

The territory making up the Toledo districts includes the lower peninsula of Michigan, northern Indiana and Ohio, northwestern Pennsylvania, western New York State and the province of Ontario, Canada west of line from Toronto to southern end of Georgian Bay.

News of Washington Activities

By PAUL WOOTON

Industrial preparedness will all but eliminate the chance of profiteering against the Government in the event of war. This was one of the points made by the Assistant Secretary of War in the course of an address before the District chiefs of the Ordnance Department at a dinner held in Washington May 7. Assistant Secretary Davis on that occasion said, in discussing the question:

"I want to bring out the vital necessity of making our plans so thoroughly and carefully that if we are compelled to use our armed forces in the defense of the nation we will be able to terminate any war in the shortest possible time. An early termination of a war means a great deal to any nation. In planning for the production of munitions, you Ordnance gentlemen are considering measures to reduce the time interval required to obtain maximum production in order to meet the needs of the war army. As you succeed in doing this, so the financial burden of maintaining our war reserves in time of peace will be reduced, because if you can so plan with industry as to get into production in vital munitions three months earlier than is possible without planning, the War Department can reduce its war reserve accordingly. If, however, your time of bringing our industrial effort to maximum production is extended, then during times of peace we will be compelled to maintain a larger war reserve with its attendant expense of storing, over-hauling, and replacement.

"This early production of munitions reduces the post-war financial burden. An examination of the cost of the last war and the sum which in consequence we are now burdened with, seems to indicate that this post-war burden will be reduced at a rate in excess of one million dollars for each hour clipped from the date of the ending of the war. Early munitions production in insuring an early termination of any war obviates the necessity for large sacrifice of men and allows us to expend shells instead of lives.

Will Curb Profiteering

"There is another angle to the necessity for proper planning in advance which is constantly impressed on all of us. I refer to the fact that proper planning in advance will reduce the opportunity for profiteering. If we are able to place our orders for munitions at the very outbreak of the war, we can place them with qualified industry at current prices. This will tend to stabilize prices and services. I also believe that our proposed war contracts will practically eliminate the chances of profiteering against the government.

"One of the outstanding lessons of the World War was the necessity for organizing in a most adequate manner not only the armed forces, but also providing for mobilizing our industries. Skill and valor on the battlefield are essential for victory; lack of industrial capacity or its proper utilization may be fatal. The task of planning for the military effort is being directed by our Chief of Staff. Plans for the industrial effort must be made by leaders of industry. The Assistant Secretary of War is charged with the duty of securing their co-operation and assistance.

"Our enormous material resources are known to the world. If these resources, as well as our manhood, stand in readiness for our defense we may live in security—perhaps in peace."

Service vs. Rates

Those Senators and Representatives who have been planning to make a drive at the next session of Congress for reduced freight rates are perturbed by the prospect that such agitation will not arouse much popular enthusiasm. When prices are good, the average shipper is more interested in service than he is in the rate. On most commodities, including even farm products, the freight rate really represents a small percentage of the selling price. When prices are hovering around the cost of production, the freight charge looks big.

For that reason the agitation of railroad legislation in 1921 and early in 1922 struck a popular chord. It appealed particularly to the demigogues of Congress. It is believed, however, that in prosperous times there will be no general support for any legislation, which would instruct the Interstate Commerce Commission to regard an amount less than six per cent as a fair return or to take into account other factors which would have the effect of lowering rates.

Transportation specialists in Washington agree that more efficient service is being rendered by the railroads at this time than ever before has been the case. The proportion of unfilled car orders to the total loadings is very small. This has been made possible through closer co-operation and more friendly relationships with the shippers, through the reduction to the minimum of bad order equipment, and through the placing in service of increasing numbers of new cars.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb.....	$0.034	$0.0326	$0.0236
Cold finished shafting.....	per lb.....	0.042	0.0406	0.032
Brass rods.....	per lb.....	0.1913	0.1913	0.15
Solder (½ and ½)	per lb.....	0.2812	0.30	0.21
Cotton waste..	per lb.....	0.1231	0.1231	0.104
Washers, cast iron (½ in.)...	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100.....	2.96	2.96	3.11
Lard cutting oil	per gal.....	0.592	0.575	0.608
Machine oil....	per gal.....	0.349	0.349	0.40
Belting, leather, medium.....	off list.....	42½%	42%	48½%
Machine bolts up to 1 x 30 in.	off list.....	44¼%	44¼%	62½%

Indiana Business Shows Slight Decline

Strictly speaking, the machinery business is becoming somewhat spotted, judging from some of the larger dealers here. Some lines continue big in the field, but there are some where less activity is shown. For instance one of the big brick machine manufacturers in the central West located here, reports a phenominal demand for all sorts of machinery in his line. This activity is reflected back to the dealers in used machinery, who say they are getting numerous requests from various parts of western Indiana asking for used machinery they are unable to find. There is beginning to be a little more activity in the coal machinery business, but as yet the demand is far below normal.

Indiana operators are working only about one-third time and while this is the season for repairs, the past winter has put many of them in such financial condition that any large repair programs can not be undertaken without reorganizing the companies and securing more capital. Many would take a chance, machinery men here say, if the prospect for fall business was good, but it is not and they are holding off until the economic signs can be more thoroughly analyzed. The past two weeks have witnessed a decline in the machine tool demand from the automotive and allied industries. Production in many of the plants here has been slightly curtailed, the early Spring production being out of the way. Fabricating plants here, making structural steel, report increasing business and their tool needs also are increasing. Railroads are inquiring in most of the shops but no important buying is reported by either dealers or manufacturers.

Chicago Machinery Club Elects Officers

The recent election of officers and directors of the Machinery Club of Chicago resulted in the following: S. A. Ellicson, Chicago Pulley & Shafting Co., president; H. S. White, Cleveland Twist Drill Co., vice-president and secretary; H. F. Kempe, H. F. Kempe & Co., assistant secretary and H. J. Reeve, the Reeve-Fritts Co., treasurer. The officers together with the following, form the board of directors: H. Barrett, Barrett, Christie Co.; R. W. Barry, Drying Systems, Inc.; D. R. Hoffman, Steel Sales Corp.; F. L. Kohlhase, National Stamping & Electric Co.; H. E. Procunier, Moon Manufacturing Co.; C. H. Roth, Roth Brothers; W. Slack, Torchweld Equipment Co., and E. P. Welles, Charles H. Besley & Co.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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MOST of the speculative markets moved in unison last week. On Monday and until Tuesday noon stocks, cotton, grain and sugar were all weak. On Tuesday afternoon a general recovery set in and by Friday evening substantial advances had been recorded.

A unanimity of movement so marked and unusual suggests a common cause for it. It is probably to be found in the decision of the Federal judges who denied Attorney General Daugherty's application for an injunction that would have stopped trading in sugar futures and set a precedent for similar action in the case of other future markets.

From the time it was announced that this injunction would be asked for the commodity markets had all been declining and it was not until the pleadings revealed the weakness of the Government's case that they commenced to recover their poise. The depreciation caused meanwhile ran into the hundreds of millions and it is not surprising that it was reflected in the stock market and by a slackening in distributive trade, where activity is largely dependent upon the probability of agricultural prosperity.

In so far as sugar itself is concerned, it is worth while to recall briefly the various steps taken by the Government. Early last Autumn, in terms that were almost the equivalent of a demand, General Crowder proposed that the Cuban Government should limit the production of sugar in the island to 2,500,000 tons, which would have been about five-eighths of a normal crop.

This proposition was declined, and about two months ago the Department of Commerce, under Secretary Hoover, issued a bulletin which was generally construed as indicating a serious shortage in the world's supply of sugar. On this bulletin sugar advanced sharply and Secretary Hoover then said that the bulletin had been misinterpreted, but sugar continued to advance and Attorney General Daugherty announced that he would try to enjoin the speculators responsible for the rise.

Some one then undertook to get the women to agree not to buy sugar and Mr. Hoover openly expressed his approval of what was manifestly a conspiracy in restraint of trade. Now the injunction has been refused, the feminine boycott has collapsed and the shortage of sugar has been so widely advertised that it will probably go higher than ever. The record is cited to show the futility and foolishness of trying to control the markets by governmental action as well as for the light it sheds upon the intimation of the Federal Reserve officials that their control of credit will be used to control prices and ensure "productivity."

Even in war times when nearly every one approved it, price control proved to be almost impossible and those who attempt it when the country is at peace are likely to fail.

As this has been realized the markets have ceased to be intimidated and with business reported good to excellent almost everywhere it is quite possible that the recent decline may soon be entirely wiped out.

The stock market, where a large short interest has recently been created, seems to indicate such a recovery, and the railroad stocks in particular should soon commence to reflect the April earnings that the largest month's traffic on record should yield.

> "The steel industry seems to have felt the recent April storm but little, although a lessened demand for structural shapes is indicated by the undoubted contraction in building operation caused by high wages—The money market shows little or no change and there is less talk of an advance in the rediscount rate—The French answer to Germany's offer was quite as expected in this country."

The oil stocks are, however, still under the cloud of the petroleum war, and the small outside speculator would do well to avoid being drawn into a fight of the giants.

The steel industry seems to have felt the recent April storm but little, although a lessened demand for structural shapes is indicated by the undoubted contraction in building operations caused by the high wages. The copper market is still lacking in enthusiasm at 16¼ to 16⅝ cents, but it seems to be a case of a large demand and an equally large supply, with the powers that be opposed to any great advance. If the market is, as some allege, under control, that control is conservative.

Corn and wheat, which declined sharply under the shadow of the injunction suit, have been somewhat steadied as the monthly report of the Agricultural Department indicates a winter wheat crop that is substantially below the average of the last five years.

Cotton seems to have discounted all that is presently bearish in the situation and the season is so backward that it will be easy to alarm the rather large short interest in new crops. Wool and woolen goods continue monotonously firm, here and broad.

The money market shows little or no change and there is less talk of an advance in the rediscount rate, although the offering of $400,000,000 Treasury Certificates at 4⅜ per cent would seem to indicate that Secretary Mellon does not expect any decline in the rate. The weekly statement of the Federal Reserve System shows a gain of over $8,000,000 in gold and a reserve ratio of 76.1 which compares with 75.2 per cent a week ago. These figures indicate a plethora of unused credit.

The French answer to Germany's offer was quite as expected in this country, but its uncompromising tone appears to have created some uneasiness in Great Britain, where the sentence of 15 years' imprisonment imposed upon Bertha Krupp's husband for encouraging resistance to the French in their occupation of the Ruhr is rightly regarded as furnishing more fuel for the rekindled fires of Franco-German hatred.

The optimistic view is that the military strength of France will enable her to avert the inevitable renewal of the war for some years, and that in the interval Germany may be rendered impotent by dismemberment.

Meanwhile America is gradually reconciling herself to chaos as a permanent condition in Europe and is becoming indurated to the disturbing stories that are cabled from across the Atlantic. But it remains to be seen whether we can maintain the economic aloofness that our political aloofness implies. This will not be decided until after the harvest season, when we must find a market for the surplus of our agricultural production. Until then a continuance of our autogenous commercial activity at gradually advancing prices seems to be indicated.

A novel and interesting development is suggested by a report from Cuba which states that $100,000,000 of American paper money is now in circulation in that island. From Europe it is also reported that American paper "dollars" are being extensively hoarded over there and it is quite possible that the belief in the widely advertised wealth of the United States may make our Federal Reserve Notes universally acceptable as an international currency against which we will continue to hold the major portion of the world's gold.

Machine Tool Exhibit in September

The New Haven Branch of the American Society of Mechanical Engineers will hold its third annual machine tool exhibit next September. The exhibit held last September attracted a crowd of more than 12,000 visitors.

Where Can German Machinery Makers Compete?

Cost of production and value of mark make open market with world almost an impossibility—More dark clouds sighted in the offing—Labor troubles, as usual

By OUR BERLIN CORRESPONDENT

AT THE BEGINNING of March the market of the machine building industry, like that of most other lines of industry, has entered into a new stage, characterized by a rapid decline of business. The beginning of this movement dates back to the early part of last Fall.

This makes clear that the Ruhr occupation is not its organic cause, but has only precipitated it. It is further easy to see, that of the various adverse circumstances, which combined to produce the rapid downslide, the mark stabilization stands foremost, the disintegration of the country by the blockade following, while shortage of coal or other raw materials, which at first seemed to be the most threatening item of the situation, has so far played only a minor part in it. The mark stabilization was of the German Government's own deliberate making. The isolation of the occupied zones from the German interior is a measure of the other party to the conflict, but the German Government has done its best to make it more effective by countermoves of its own.

Blocking Business by Red Tape

If one reads the long list of French ordinances issued for the district and the equally long German instructions to parry them, there seems indeed hardly any elbow room left for business activity. Merchandise traffic between the occupied parts and the outside world has been reduced to the standard of illegal practice in the eyes of one or the other of the hostile parties according to what line of conduct the respective business man is taking. If a manufacturer in the occupied zones needs material from the interior of Germany or vice versa, or if he wants to ship his products to an outside destination, an export or an import permit is required and taxes have to be paid, except for goods which are on the German free list. The occupying force requires the taxes paid to them and the export or import permit to be obtained from the allied offices, which the German manufacturer is forbidden by his Government to do. Offenders are at once black-listed, and such is the spirit of the population, that the offense is considered nothing short of high treason. This has most effectively prevented manufacturers from leaving scruples behind and make the best of the situation. It is, however, an exaggeration of facts to pretend that merchandise traffic has stopped entirely across the occupation cordon. Such as is performed has, however, not the appearance of legitimate trading, but rather of smuggling practice.

That the severed communication between the German West and the interior, which are so essentially dependent on each other, has not immediately resulted in a more complete disorganization of business than has taken place, is partly due to the reserves accumulated in each part and partly to a well-organized scheme of redistribution of the supply. The buyer on the one side of the occupation cordon applying to the seller on the other side is at once directed to a source of supply on his own side. The industrial associations have taken this in hand and are watching that it is carried out in the spirit of a community of interests.

The coal situation in the German interior is even after three months of Ruhr blockade not giving any cause for apprehension. The mystery surrounding the situation, which against all expectations and even calculations based upon German statistics of coal supply, has developed no shortage worth speaking of, is now clearly solved by the undoubted existence of large reserves accumulated prior to the occupation. This applies even stronger to the supply of iron, steel and metal. In addition it has evidently not been very difficult to supplement the Ruhr supply of metallurgical products by imports from surrounding countries through the already existing numerous German trade organizations.

> "The machine building industry could doubtless have withstood the strain caused by the occupation, for a long time to come had it not been for the attack coming from home quarters in the shape of mark stabilization. The business situation has assumed all of the hallmarks of what is known from experience in other countries as a stabilization crisis. The wisdom of the Government, to add it to the difficulties arising from the occupation, must in the light of the results be seriously doubted."

The machine building industry could doubtless have withstood the strain caused by the occupation for a long time, had it not been for the attack coming from home quarters in the shape of the mark stabilization. The business situation has assumed all the hallmarks of what is known from experience in other countries as a stabilization crisis. That such crisis would come one day, when the stabilization would be taken in hand seriously, every manufacturer realized fully. The wisdom of the Government, to add it to the difficulties arising from the occupation, must in the light of results be seriously doubted. Moreover, experiences of the first two months have made it quite clear that the mark stabilization, if it was intended to create a healthier business situation in the interest of the policy of resistance, has been a signal failure.

Cost of living has been continuing its upward move slowly but steadily. Agriculture, the only really independent element of the population, has not been unbending to the Government's will or to the interest of the national cause. This has opposed the intention of the Government to at least arrest the wages at the level of the last adjustment. As far as it had been carried it has produced a perceptibly growing tension in the labor situation, which the country above all things can not afford. Manufacturers were indeed giving way to it by granting small increases independent of the wages tariff. The often heard assumption, that there is still sufficient margin of profit left for them to make such grants without increasing the prices or even after reducing them to meet the trend of the market, is erroneous, as a few figures will demonstrate. Taking as an instance a machine, whose cost of production used to consist in pre-war times of the following component parts: material 500 marks, wages 600 hours costing 300 marks, overhead 150 per cent on wages or 450 marks, total 1,250 goldmarks. Under present conditions the cost of production would be the following, whereby it has been taken into account, that the efficiency of labor is only about 60 per cent and overhead has grown to 200 per cent of wages:

Labor 800 hours at 2,300 marks per hour 1,840,000 marks, overhead 200 per cent of wages 3,680,000 marks, material 4,500,000 marks, total 10,020,000 marks.

Cost of production is therefore about 8,000 times higher than in pre-war times. This corresponds exactly with sales prices, which ranged for machine tools from seven thousand to ten thousand times of the pre-war prices according to size. For export sales prices have even to be a little higher on account of the export tax, higher freightage and the additional expense for the soliciting of orders.

What Prices Must Be Asked

A little diagram has lately been published in one of the machine building journals showing what rate of exchange would be required to allow German machinery to compete in various importing countries according to their rate of exchange and their price level. It was found, that on the basis of prices and cost prevailing German machinery can compete with all countries at a rate of exchange above 25,000 marks to the dollar. If this rate of exchange were between 25 and 19,000 it could compete only in Sweden, Holland, Switzerland and England of European countries. If it were below 19,000 it could compete nowhere. This diagram demonstrates that the large profits, which undoubtedly have been made, can only be realized as long as the downward movement of the rate allows prices and cost to move in the same direction with the movement of prices ahead of the other. This is also the reason why prices of machinery are not weakening, although many of the manufacturers, by the radical contraction of credits compelled by the Government's measures in furtherance of the mark stabilization, have been placed in a rather precarious position.

The only positive measure of the Government for the lowering of the price level, the reduction of coal prices, had produced a slight decrease of iron and steel prices, but only to the extent

of the reduction in the cost of production resulting therefrom. As a prime mover for a more continuous drop it has failed.

Another important reason why the mark stabilization has proved ineffective in lowering the price level is the lack of confidence in the former's duration. This fact in conjunction with the tightness of credit has caused the general retrenchment, which was the chief cause of the sudden collapse of the market. Inquiries had almost ceased quite abruptly. The volume of orders in hand has been dwindling down by cancellations. Manufacturers unable financially to work for stock are compelled to reduce working time. The Rhenish, South German and Saxon machine tool works have mostly reduced working time to 24 hours per week. Were the demobilization ordinances not still in force, which prevent the dismissal of workmen, unemployment would have taken place on a large scale. It is an open secret, that the mark stabilization has been undertaken chiefly under the pressure of trade unions in the belief that it would support the spirit of the working population. This has worked quite satisfactorily in the Ruhr only, because subsidies from public funds have allowed manufacturers to keep their men in bread and butter. This sort of official providence for the working classes could, however, not extend to the German interior with the result that the income of the workmen has been dwindling down in consequence of the reduction of working time. The workmen have realized, what manufacturers knew already too well, that the mark rolls only as long as it slides down. The opposing forces behind the stabilization on the one hand and the exigencies of industry on the other hand, with which the workmen's interests are becoming more and more identical, are engaged in a fight which is bound to increase in bitterness in proportion to the deepening of the stabilization crisis. If it is an open question, which side will gain the upper hand, it is quite certain, that the machine building industry will emerge from it in a financially greatly weakened state.

Chamber of Commerce in Haiti

On March 16 the American Chamber of Commerce of Haiti was organized, with headquarters at Port au Prince. The membership of this organization has been tentatively divided into three classes: Active, associate, and honorary. Membership at present is to be limited to American citizens and firms.

This organization, which has as its principal purpose the support of the convention between the United States and Haiti and the fostering of closer trade relations between the two countries, has received the indorsement of the President of Haiti and the American High Commissioner to that Republic.

British Iron Exports Are Increased

British exports of iron and steel products increased during March, the total for that month being 368,072 long tons, as compared with 317,568 tons in February and 353,389 tons in January. Imports of iron and steel into Great Britain declined from 122,664 long tons in February to 110,965 tons in March.

Student Engineers Make Inspection Trip

The western inspection trip of the department of Mechanical and Electrical Engineering of Ohio State University has recently been completed. The party left the Columbus, Ohio, railroad station on Monday morning April 30 arriving a few hours later in Dayton where the plant of the National Cash Register Co. was visited. In the afternoon the Dayton Engineering Laboratories Co. was visited and the plant inspected.

On the following day the students visited the plants of the Dayton Power and Light Co., the General Motors Research Corp. and the Delco Light Co.

Detroit was visited following Dayton and the plants inspected included: Ford Motor Co., Michigan Copper & Brass Co., the Detroit News, the Great Lakes Engineering Works, the Hudson Motor Car Co., and several other plants.

Gary Ind., Indiana Harbor and Chicago were also visited on the trip. The plants of the Inland Steel Co., the Universal Portland Cement Co., the Commonwealth Edison Co., the Illinois Steel Co., the American Sheet & Tin Plate Co., the American Bridge Co., the Western Electric Co., the Griffin Wheel Co., and other prominent manufacturers were inspected.

Trade Catalogs

Precision Tools. Stark Tool Co., Waltham, Mass. A new catalog has been issued by this company showing its line of precision bench lathes, countershafts, milling attachments, screw cutting attachments, screw machine units and various other attachments as well as the Stark plain bench milling machine. Many specifications and much interesting data are contained within the twenty-five pages.

Files. Simonds Saw & Steel Co., Fitchburg, Mass. Files of every size and cut are shown in the recent catalog issued by the Simonds Saw & Steel Co. Flat, wedge shaped, triangular, square, round, and half round files are described as to their usefulness as well as thickness and length.

Leather Belting. Charles A. Schieren Co., New York City. Facts about belting and its application to machinery are contained in a catalog recently issued by this company. Besides specifications, charts, layouts and other data, an interesting chapter is devoted to the care and operation of belts and pulleys.

Multi-Purpose Lathes. Samuel K. Landis, Lancaster, Pa. The Landis multi-purpose lathe and cylinder grinding machine is fully described and illustrated in the catalog that has just been issued by Mr. Landis. The booklet is attractively made and shows in addition to the descriptive pictures of the product, interior views of the factory at Lancaster, Pa.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Horticultural tools and machinery. Christchurch, New Zealand. Purchase and agency. Reference No. 6249.

Seed cleaning machinery and general agricultural machinery. Waimate, New Zealand. Purchase and agency. Reference No. 6250.

Mechanical tire-inflation equipment for garages. Lyon, France. Purchase and agency. Reference No. 6253.

Machinery and wire for manufacturing bed springs, filling and covering mattresses, and machinery for nickel plating. Santiago, Cuba. Agency. Reference No. 6262.

Iron and steel products such as wire and tin plate, and also cement. Porto Alegre, Brazil. Agency. Reference No. 6263.

Continuous-bucket type of coal chutes. Adelaide, South Australia. Purchase. Reference No. 6265.

Gold-dredging machinery, apparatus for use in placer-mining stamp mills for quartz mining and similar equipment. Guaymas, Mexico. Purchase. Reference No. 6266.

Modern flour-milling machinery. Moravia, Czecho-Slovakia. Purchase. Reference No. 6268.

Coal-mining machinery and supplies. Madrid, Spain. Agency. Reference No. 6269.

Apparatus and machinery for producing alcohol from molasses. Montreal, Canada. Purchase. Reference No. 6270.

Jute-weaving machinery and portable timber-cutting machines. Saigon, Indo-China. Purchase. Reference No. 6271.

Embroidery machines, tracing and perforating machines. Sydney, Australia. Reference No. 6272.

Agricultural machinery, including spinning and grinding machines. Sierra Leone, Africa. Purchase. Reference No. 6303.

Agricultural machinery and implements. Vukovar, Yugo-Slavia. Purchase and agency. Reference No. 6304.

Pipe-bending machinery. London, England. Agency. Reference No. 6308.

All bakery machinery. Chihuahua, Mexico. Purchase. Prices and illustrated catalogs desired. Reference No. 6309.

Gas and oil engines and power pumps. London, England. Agency. Reference No. 6310.

Machinery and equipment for brass foundry. Christchurch, New Zealand. Purchase and agency. Reference No. 6311.

Machinery and equipment for rubber heel factory. Dublin, Ireland. Purchase. Reference No. 6312.

Electric conveyor for iron ore with a capacity of 1,000 tons per hour, over a distance of approximately 250m. Bilbao, Spain. Purchase. Reference No. 6313.

Machinery for making piano-player rolls. Chihuahua, Mexico. Purchase. Reference No. 6315.

Tanning machinery. Provadia, Bulgaria. Purchase. Reference No. 6316.

Internal combustion engines, agricultural machinery and implements. Cairo, Egypt. Purchase and agency. Reference No. 6317.

Machine tools, lathes and metal-drilling machines. Seville, Spain. Purchase. Reference No. 6318.

Home knitting machines. Wellington, New Zealand. Purchase and agency. Reference No. 6319.

Machinery for the extraction of turpentine and byproducts. Guadalajara, Mexico. Purchase. Reference No. 6321.

Shipbuilding machinery. Toulon, France. Agency. Reference No. 6328.

Forthcoming Meetings

National Association of Purchasing Agents. Annual convention, Cleveland, May 15 to 18. H. R. Heydon, 19 Park Place, New York City, secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society of Mechanical Engineers. Spring meeting at Montreal, Can., May 28 to 31. Calvin W. Rice, 29 W. 39th St., New York City.

American Society for Testing Materials. Annual meeting at Atlantic City, June 25 to 29, Chalfonte-Haddon Hall. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

Society of Automotive Engineers. Summer Meeting. Spring Lake, N. J., June 19 to 23.

American Society for Steel Treating. Eastern sectional meeting, Bethlehem, Pa., June 14 and 15. Hotel reservations through George C. Lilly, Superintendent of Heat Treatment, Bethlehem Steel Co., Bethlehem, Pa.

American Society for Testing Materials. Twenty-sixth annual meeting. Calfonte-Haddon Hall, Atlantic City, N. J., June 25 to 29. Headquarters, Engineers Club Building, 1315 Spruce St., Philadelphia, Pa.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Blue annealed and black steel sheets up 35c. per 100 lb. at Pittsburgh mill. Mills taking on more business in tin plates; although prices have sagged slightly during last week, quotations on charcoal plates are now about 1½c. per lb. higher than month ago. Cotton waste, colored, up 1c. per lb.; washed white wiping cloths at minimum of 11¼c., against 11c. per lb., one week ago.

Declines—Pig-iron quiet generally. Iron and steel scrap lower. Steel prices tending downward. Shapes, plates and bars, $2.50@$2.60 per 100 lb., Pittsburgh, for desirable tonnages; maximum at $2.65, against $2.75 recently. Premiums on plate shipments disappearing from market; buying in both plates and structurals confined to smaller tonnages. Steel price peak evidently reached and passed with tendency to approach nearer to a $2.50 base. Price depression in nearly all non-ferrous metals; copper, particularly, affected by uncertain foreign situation and overpurchasing on the part of consumers. Dealers purchasing prices of old metals, non-ferrous, down 1c. per lb.; tending lower. Spot coke market receding.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$31.55
Northern Basic	32.27
Southern Ohio No. 2	33.27
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	34.94
BIRMINGHAM	
No. 2 Foundry	27.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	32.64
Virginia No. 2	35.17
Basic	31.50
Grey Forge	31 00
CHICAGO	
No. 2 Foundry local	33.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	33.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	31.00
Basic	31.00
Bessemer	31.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	5.00
Cleveland	5.60@6.25
Cincinnati	4.00@6.00
New York	5.50@5.75
Chicago	4.00@5.00

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00@3.35	4.59	3.90	4.15
No. 12	3.10@3.45	4.64	3.95	4.20
No. 14	3.20@3.55	4.69	4.00	4.25
No. 16	3.40@3.75	4.79	4.10	4.35
Black				
Nos. 17 and 21.	3.70@4.10	4.95	4.55	4.85
Nos. 22 and 24.	3.75@4.15	5.00	4.60	4.85
Nos. 25 and 26.	3.80@4.20	5.05	4.65	4.90
No. 28	3.85@4.25	5.15	4.75	5.00

Galvanized	Pittsburgh	New York	Cleveland	Chicago
Nos. 10 and 11.	4.00@4.50	5.15	4.80	5.10
Nos. 12 and 14.	4.10@4.60	5.25	4.90	5.20
Nos. 17 and 21.	4.40@4.90	5.55	5.20	....
Nos. 22 and 24.	4.55@5.05	5.70	5.35	5 65
No. 26	4.70@5.20	5.85	5.60	5 80
No. 28	5.00@5.50	6.15	5.90	6.10

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	⅜ to 1¼	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	26	11
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾ to 1¼	30	14
2 to 3	61	50½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	52%	39%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	49%	36%	53½%	40½%	59½%	45½%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 10%. Cast iron, standard sizes, 21½% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods(base)	7.50@8.00	8.00	7.35
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.40	3.90	4.30
Cold finished flats, squares	4.90	4.40	4.80
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.32½
Soft steel bar shapes (base)	3.54	3.36	3.32½
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.71	3.40
Bar iron (3.25 at mill)	3.54	3.36	3.32½
Carbon tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%
Electric welding wire:			
5/32	8.50		14.00
⅛	7.35		12.25
5/32 to ¼	7.10		11.00

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			17.00
Tin, 5-ton lots, New York			45.00
Lead (up to carlots), St. Louis	7.00;	New York.	7.67½
Zinc (up to carlots), St. Louis	6.80,	New York.	7.25

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.20	30.00	28.50
Antimony (Chinese), ton spot	8.62½	11.00	8.75
Copper sheets, base	26.50	25.75	23.00
Copper wire (l.c.l.)	19.62½	22.00	16.25
Copper bars (l.c.l.)	23.50	25.25	19.50
Copper tubing (l.c.l.)	28.00	30.25	23.00
Brass sheets (l.c.l.)	21.75	25.25	18.75
Brass tubing (l.c.l.)	26.50	30.75	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (l. c. l.)	20.00	21.00	15.75
Brass wire (l. c. l.)	22.25	22.00	.....
Zinc sheets (casks)	11.00	10.90	.....
Solder (½ and ½), (caselots)	31.50	29.50@31.50	20.00
Babbitt metal (83% tin)	60.00	55.00	41.00
Babbitt metal (35% tin)	35.00	17.50	18.00
Nickel (ingot and shot), Bayonne, N. J.	29.00	.....	35 00
Nickel (electrolytic), Bayonne, N. J.	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	55
Hot rolled rods, Grade "A" (base)	50
Cold drawn rods, Grade "A" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled rods "E"—low manganese (base)	54
Manganese nickel hot rolled rods "D"—high manganese (base)	57

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	46.00
Hot rolled sheets (base)			45.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	13.50@14.00	13.50	14 00
Copper, heavy, and wire	13.25@13.75	13.00	13.00
Copper, light, and bottoms	11.25@11.75	11.00	12.00
Lead, heavy	5.00@ 5.50	5.00	6.25
Lead, tea	4.50@ 4.75	4.00	5.25
Brass, heavy, yellow	7.50@ 7.75	....	8.50
Brass, heavy, red	11.00@11.50	11.00	10.50
Brass, light	6.00@ 6.50	6.00	7.00
No. 1 yellow brass turnings	7.50@ 7.75	7.50	7.75
Zinc	3.75@ 4.25	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

	New York	Cleveland	Chicago
"AAA" Grade:			
IC, 20x28, 112 sheets	23.50	19.50	18.50
IX, 20x28, 112 sheets	26.00	22.25	20.90
"A" Grade:			
IC, 20x28, 112 sheets	21.00	17.00	17.00
IX, 20x28, 112 sheets	23.50	19.75	19.60
Coke Plates, Bright			
Prime, 20x28 in.:			
100-lb., 112 sheets	13.00	12.20	14.50
IC, 112 sheets	13.30	12.60	14.80
Terne Plate			
Small lots, 8-lb. Coating:			
100-lb., 14x20	7.00	6.65	7.25
IC, 14x20	7.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11½
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13½x13½, per lb.	11.25	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	3.50	2.65
Roll sulphur, per 100 lb.	2.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.16	1.30	1.37
White lead, dry or in oil	100 lb. kegs.	New York,	14.50
Red lead, dry	100 lb. kegs.	New York,	14.50
Red lead, in oil	100 lb. kegs.	New York,	16.00
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.00@4.50	
Coke, prompt foundry, Connellsville	per net ton	6.50@7.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	30%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	15%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	20%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	30%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	25%	45%	40-5%
Bolt ends, with hot pressed nuts	30%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅜ and smaller	60%	.....	.....
Semi-finished nuts, ½ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅝ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	List net	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	List net	2.75	2.50
Rivets:			
Rivets, ⅞ in. dia. and smaller	40%	50-10%	60%
Rivets, tinned	40%	50-10%	4½c. net
Button heads ⅜-in., ⅞-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

Lard cutting oil (50 gal. bbl.) per gal.	$0.60	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88:			
Medium grade	30-10%	40½%	50%
Heavy grade	20-5-2½%	30-5%	40-5%
Rubber and duck:			
First grade	50-10-5%	50-10%	40-10%
Second grade	60-10%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2.67	3.20

New and Enlarged Shops

Machine Tools Wanted

Ga., Athens—The Shop, Box 662 (machine shop)—power drill press and power metal lathe.

Ill., Chicago — Chicago Bridge & Iron Wks., 608 South Dearborn St. (steel tanks and plates)—traveling crane, punch and drill presses, for new addition to plant, at Greenville, Pa.

Ill., Rockford—A. C. Price Co., 313 South Church St., (auto repairs)—18-20 in. drill press, small grinder and air compressor.

Kan., Hutchinson—Auto Electric Co., 19 West 2nd St.—power lathe (used).

Kan., Hutchinson — L. Bailey, Palace Theatre, 5th and Washington Sts.—power lathe for garage.

Kan., Hutchinson—R. R. Cox (machine shop)—power drill press, lathe, belting, hangers and pulleys.

Kan., Hutchinson—D. Fetzer Auto Service, 623 North Main St.—cylinder grinder with power attachment (used).

Kan., Hutchinson—Hafer & Marsh, 115 East 2nd St.—power drill press, taps and dies (used preferred).

Kan., Hutchinson — Harley-Davidson Cycle Co., 127 North Washington St. — power drill press.

Kan., Hutchinson—Hutchinson Interurban Ry. Co., Main St., G. E. Humber, Purch. Age.—large power lathe (used).

Kan., Hutchinson — Modern Machine & Welding Co.—power cylinder grinder.

Kan., Hutchinson—Salt City Welding & Machine Wks., 14 4th St., W., G. A. Benignus, Purch. Agt.—38 in. power lathe.

Kan., Hutchinson — Superior Welding Shop, 114 South Washington St., H. C. Gass, Purch. Agt.—large lathe for power attachment.

Kan., Hutchinson—J. L. Ward, 115 South Walnut St., (blacksmith)—power lathe (used).

Ky., Louisville — C. J. Walton & Son, 1221 West Main St.—one 12 ft. power brake and 1 shear and punch.

Me., Camden—Camden Yacht Building & Marine Ry., Inc.—complete equipment, incl. large and small lathes, planers, boring mill, shaper, drills, motors, shafting and small tools, for proposed machine shop.

Mass., Dorchester (Boston P. O.)—Columbia Garage, 4 Milton Ave., A. Ballard, Purch. Agt.—1 in. upright electric drill, one shaper, medium size and 1 lathe, 8 ft. bed, 16 in. swing (used).

Mich., Detroit — Waterhouse Laundry Mchy. & Supply Co., 1747 Abbott St. — one radial drill.

Miss., Jackson—Mississippi Fdry. & Machine Co.—machine shop equipment to include chuck, press, drill, shears, welders, etc.

N. Y., Brooklyn — Mutual Electric & Hardware Mfg. Co., 28 Verandah Pl. — power press, single and double.

N. Y., Buffalo—Donner Union Coke Co., Abby and Mystic Sts.—machinery and equipment for car repair shop.

N. Y., Buffalo—Kinley Electric Co., 1355 Fillmore Ave.—one plain milling machine, one 16 in. lathe, quick change gears, one arbor press, one power hacksaw and one shaper.

N. Y., Buffalo—C. M. Qettman, 295 Fillmore Ave.—equipment for auto repair shop.

N. Y., Canisteo—Canisteo Iron Works.—machine shop equipment to replace that which was destroyed by fire. Loss $20,000.

N. Y., Cortland—H. T. Tayntor—gasoline and service station machinery, tools and equipment.

O., Akron — Pittsburgh Erie Saw Co., 1006 Grant St.—machinery and equipment for saw manufacturing plant.

O., Ashland—D. Smith 124 East Liberty St.—small screw cutting engine lathe (new or used).

O., Cambridge—Cambridge Steel Co.—straightening machine for bars and shapes, Kane & Roach No. 4 preferred.

O., Columbus — International Telephone Co., Atlas Bldg. (manufacturer of telephone and radio equipment), D. Learned, Purch. Agt.—one precision lathe and probably milling machine.

O., Columbus—Lambert Metal Door Co., 162 Noble St., B. E. Lambert, Mgr.—metal working machinery, incl. punches and shears.

O., East Liverpool—National Products Co. (metal workers)—one 10 ft. 6 in. bending roll; one radial drill, 4 ft. swing maximum capacity 1¼ in.; one punch shear; one Bull riveting machine.

O., Massillon—B. F. Jones—complete set of tinners equipment.

O., Newton Falls—Akron-Newton Furnace Co.—machine shop equipment, incl. drills, presses, forge, etc., for 75 x 75 ft. machine shop now under construction.

O., Youngstown — Youngstown Sheet & Tube Co., Stambaugh Bldg.—one 42 in. and one 30 in. lathe, planer and horizontal boring machine.

Okla., Picher—F. S. Scott, P. O. Box 1707—drill, chuck, lathe and other machine shop equipment.

Pa., Danville—Danville Galvanizing Co. —complete machinery and equipment for proposed $50,000 metal working plant.

Pa., Jermyn — R. M. Roderick — metal working machinery and equipment.

Pa., Leola—H. M. Stauffer & Son—sheet metal working machinery, incl. cornice breaker shear.

Pa., Martinsburg—United Steel & Car Co.—foundry and machine equipment for new plant.

Pa., Meadville—Champion Tool Co.—machinery and equipment incl. punches, presses and shears for new $100,000 addition.

Pa., New Castle — Studebaker Garage, North Mercer St.—equipment, incl. press, drill, tools, etc., for garage, service station and repair shop, now under construction.

Pa., Phila.—Ford & Kendig Co., 24th and Wood Sts. (plumbing supplies)—12 in. pipe cutting and threading machine.

Pa., Phila.—W. Pugh, 2658 Salmond St. (machinist)—one 16 in. lathe and one 14 in. shaper.

Pa., Pittsburgh—Bessemer & Lake Erie R.R., Union Arcade—machine shop equipment to include drill, press, punch, etc., for $60,000 machine shop at Greenville, Pa.

Pa., Pittsburgh — Pennsylvania R.R., Pennsylvania Sta., W. R. Phelps, Purch. Agt.—lathes and hack saws for shops at Conway.

Pa., Sharon—Bd. Educ.—machine shop equipment, incl. drill, press, welder, etc., for machine shop in high school.

Pa., Warren—T. J. Giltinan—machinery, tools and equipment, incl. air compressor, etc., for new gasoline and service station on Pennsylvania Ave. and Parker St.

Pa., Wellsboro—Dartt Carriage & Automobile Co.—complete garage and repair shop machinery, tools and equipment, incl. drills, press, air compressor, etc.

S. C., Union—Flexible Saw Wks.—machinery and equipment for proposed factory.

Tenn., Knoxville — Duncan Mchy. Co., Box 265—14 in. lathe with taper attachment and 16 to 18 in. swing lathe, 10 ft. bed.

Wis., Big Bend—O. Eisner—auto repair machinery, gasoline storage tanks and pumps for proposed garage.

Wis., De Pere—F. Bloom—auto repair machinery, press, small tools, etc., for proposed garage and repair shop.

Wis., Madison — Capitol Garage Co., South Pinckney St., A. Hult, Pres.—several ton drill presses, lathe and small tools for proposed garage, show room and repair shop.

Wis., Madison—Gill Bros. Co., c/o A. J. Gill, 452 West Wilson St.—auto repair machinery incl. drill press, small tools and power lathe for proposed garage and repair shop.

Wis., Madison—Wiedenbeck-Doblein Co., 601 West Mifflin St.—auto repair machinery, incl. several ton drill press, lathe and small tools for proposed plant.

Wis., Milwaukee—Luedtke-Pinkert Sheet Metal Wks., 984 Booth St.—one square beader, medium size.

Wis., Oakfield—The Air Supply Station Co., F. E. Willard, Purch. Agt.—special machinery to manufacture compressors, tanks and other equipment for garages, also power machinery and small tools.

Wis., Oshkosh — Winstanley Bros. Co. — drill press, small tools and equipment for new machine shop.

Wis., Platteville—Paige-Jewett Sales & Service Co., F. Groat, Mgr.—auto repair machinery, incl. drill press, small tools, gasoline tanks and pumps for proposed garage.

Wis., Rice Lake—The Field Motor Co., T. H. Field, mgr.—new and used tools and special machinery for the manufacture of passenger car chassis.

Wis., South Byron—D. Kosich—special machinery, power machine, iron working machinery and small tools for proposed factory at Fond du Lac, for the manufacture of horticulture implements.

Ont., Amherstburg—M. Sullivan Co.—equipment for machine shop.

Ont., Collingwood—Canadian Postal Lock, Nut & Bolt Co., F. A. Bassett, Mgr. — special equipment for the manufacture of bolts, screws and rivets, $50,000.

Ont., Ottawa — Canadian National Ry. (Central Div.), Union Station, W. C. Moore, master mechanic—additional equipment for locomotive and car shops at Leaside.

Que., Dalhousie—Caza & Cluff, A. Cluff, Purch. Agt.—garage and auto repair equipment.

Que., La Baie—T. Gauthier—auto repair equipment.

Que., Lachine—Rapid Machine Co., Ltd., 172 St. Joseph St.—additional machine shop equipment.

Que., Montreal—J. O. Belair, 115 Archibald St.—equipment for garage and auto repair shop.

Que., Montreal—Central Garage, Ltd., 249 Laval Ave.—complete equipment for 3 story garage and auto repair shop.

Que., Montreal—B. M. Miller & Co., 17 St. John St., D. R. Cameron, Purch. Agt.—power punch, medium size.

Machinery Wanted

Conn., Southington—Peck, Stowe & Wilcox—electric traveling crane, 65 ft. long, 20 ton lift.

Conn., Vernon—Town, City Hall—manual training machinery incl. lathes, planers, saws, tables, benches, also small metal and woodworking tools for proposed George Sykes High School.

D. C., Brookland (Wash. P. O.)—F. G. Muckebauer, 911 Michigan Ave. (job printer)—power job press.

Ga., Columbus—Bd. Educ.—complete vocational equipment for $450,000 school.

Ill., Chicago — Chicago & Northwestern Ry., 226 West Jackson St., F. J. Berck, Purch. Agt.—sanding outfit, incl. dryers and conveyors to carry sand to engines, for yards at Madison, Wis., also ice and refrigerating machinery for icing cars at Madison, Wis.

Ind., Butler—Bd. Educ., vocational equipment for $85,000 school.

Ind., Wheatland—Bd. Educ., complete vocational equipment for $90,000 school.

Kan., Hutchinson—Mutual Press Inc., 33 West 2nd St., H. A. Carr, Purch. Agt.—power job press (used).

Kan., Hutchinson—Roberts Printing Co., 100 A St.—linotype.

Kan., Hutchinson—H. J. Weltmer Printing Co., 24 1st West St.—Miller feeder attached to power job press.

Kan., Hutchinson—Wholesaler Printing Co., 19 4th St., East, A. Dressler, Purch. Agt.—power paper cutter.

Kan., Topeka—A. H. Bennett, Woodlawn Ave.—power saw mill, cross cut saw, and planer for woodworking plant and saw mill.

Ky., Dayton — Bd. Educ. — vocational equipment, incl. saws, drills, press, small tools, etc., for $100,000 school.

Ky., Louisville—Allen Baking Co., 31st and Montgomery Sts. — equipment, incl. large ovens, for proposed extensions to plant.

Ky., Louisville—United States Engineer Office, P. O. Box 72—one portable electric bench joiner, length of knives 6 in., complete with 110 volt d.c. motor; one hand trimmer, complete with stand to cut up to 8 in. at 90 deg. and 6 in. at 45 deg., either back or front.

La., Shreveport — Caddo Parish School Bd.—vocational equipment for proposed $150,000 school at Cedar Grove.

Me., Jay—School Com.—small lathe, drill, planer, matcher, motor shafting, belting, tables, benches, and various small tools, for proposed high school.

Md., Hagerstown—Tanners Hide & Tallow Co.—melters, pressers, grinders and other tallow working machinery.

Mich., Detroit—City, Dept. Purchases & Supplies, 700 Marquette Bldg., G. J. Finn, Comr.—woodworking machinery consisting of 30 in. joiner and 24 in. planer.

Mich., Detroit—Detroit Motor Bus Co., Terminal and Edlie Aves., W. F. Evans, Pres.—one 200 ton tire-applying press.

Mich., Detroit—Homestead Creamery Co., c/o F. Swirsky & Co., 155 West Congress St., Archts.—miscellaneous equipment for general creamery.

Mich., Detroit—Mulkey Salt Co., Dix Ave. —conveying equipment for handling salt in drying room for proposed plant at River Rouge.

Mich., Grand Rapids—Slig Furniture Co. —lumber mill machinery and equipment to replace that which was destroyed by fire. Loss $200,000.

Mo., Joplin—Chanute Spelter Co., 314 Frisco Bldg., (zinc miners)—drill rigs for shale drilling.

Mo., Kansas City—J. Meyers, 543 Westport St. (cabinet maker)—power rip saw.

Mo., Marshall—J. Anderson—Hoffman steam press, dry cleaning machine and belting.

Mo., St. Louis—Amer. Fixture & Showcase Co., 1009 Lucas Ave.—belt sander, horizontal bench type.

Mo., St. Louis—Bayle Food Products Co., 1151 South Bway.—one power paper cutter.

Mo., St. Louis—Western Wire Products Co., 3rd and Spruce Sts. (bed springs manufacturers)—forge without blower, medium size.

N. Y., Buffalo—General Casting Co., 577 Tonawanda St., J. Kline, mgr.—machinery and equipment for carpenter shop, recently destroyed by fire.

N. Y., Charlotte—Charlotte Cold Storage Co., Inc.—cold storage and ice manufacturing machinery and equipment for $250,000 plant.

N. Y., Cortland — Bd. Managers State Normal School, H. D. Groat, Principal—will receive bids until May 23, for mechanical laundry machinery and equipment.

N. Y., Ft. Miller—Ft. Miller Paper & Pulp Co.—complete machinery and equipment.

N. Y., Jamestown — Empire Worsted Mills, Water St.—complete dye house machinery and equipment.

N. Y., Jamestown—Industrial Wet Wash Laundry, 304-306 Steele St.—mechanical laundry equipment for addition to laundry.

N. Y., Jamestown—Premier Cabinet Co., 61 Water St., M. J. Norquist (purch. agt.) —woodworking machinery and equipment, incl. planers, molders, surfacers, etc., for $15,000 addition to plant.

N. Y., Kendall — Kendall Evaporated Products—complete machinery and equipment incl. drying machinery, etc., for proposed factory.

N. Y., Lakewood—Union Free School Dist.—complete vocational equipment for $150,000 school.

N. Y., Lyons—J. H. Bashford Vinegar Wks.—pressers, grinders, etc., for addition to vinegar plant.

N. Y., Minetto—S. McEachen, Box 8—complete oil well drilling machine, including derrick, bull wheels, suction pump, transmission equipment, etc.

N. Y., Perrysville—Worlock Stone Crushing Co.—crushing, grinding and pulverizing machinery for proposed plant.

N. Y., Phelps—Bd. Educ.—vocational equipment for $165,000 school.

N. Y., Rochester—G. J. Gillies Corp., 268 State St.—platen printing press, medium size.

N. Y., Rochester—Michael-Sterns Co., 87 Clinton Ave., N., (clothing manufacturers) —machinery and equipment incl. cutters, stitchers, etc., for branch plant at Alboin.

N. C., Mocksville—Bd. Educ.—vocational equipment, incl. drills, saws, presses, etc., for proposed school.

O., Belleville—The Star (newspaper)— linotype machine.

O., Canton—Schory & Schellhase Ice Co., 6th St., E. Schellhase, Purch. Agt.—$150,000 worth of ice making machinery.

O., Cleveland—Belvoir Stone & Brick Co., 401 Engineers Bldg., W. T. Arnos, Mgr.— 2 belt conveyors, three 25 hp. motors.

O., Cleveland—Guide Motor Lamp Co., 2130 West 110th St.—one combination saw.

O., Columbus—Anchor Concrete Machinery Co., 530 Dublin Ave., (manufacturer of concrete and tile making machinery), G. M. Friel, Mgr.—general machinery.

O., Columbus—Claycroft Brick Co., Hartman Bldg., P. Hedges, Genl. Mgr.—one cutter for plant at Groveport.

O., Fairport (Fairport Harbor P. O.)— Diamond Alkali Co.—coke oven machinery and equipment, including handling machinery.

O., Lisbon — American Vitrified Brick Products.—brick making machinery and equipment.

O., Marion—E. M. Freese & Co.—foundry equipment.

O., Pomeroy—W. C. Wadsworth—complete foundry equipment.

Pa., Bowmansville — Aluminum Pigment & Products Co.—grinding, crushing and pulverizing machinery.

Pa., Bradford—Kendall Oil Refining Co. —complete machinery and equipment, incl. pumps, tankage, suction pumping equipment, etc., for wholesale gasoline distributing station.

Pa., Catasauqua—Bryden Horse Shoe Wks.—machinery and equipment for 2 story addition to plant.

Pa., East Pittsburgh — Westinghouse Electric & Mfg. Co., C. G. Bunnell, Purch. Agt.—one 3 ton, one 60 ton and three 20 ton electric cranes for South Phila. works.

Pa., Erie—Urick Fdry. Co.—two 3 motor electric cranes, 27 ft. spans.

Pa., Erie—Hammermill Paper Co., L. E. Randicker, Purch. Engr.—paper machinery.

Pa., Franklin—Eclipse Oil Wks.—machinery and equipment for proposed plant to replace that recently destroyed by fire.

Pa., Gettysburg—Gettysburg Ice & Cold Storage Co.—ice manufacturing machinery.

Pa., Hellam — Bd. Educ.—vocational equipment for $100,000 school.

Pa., Mahoney City—Ball Lumber Co.— machinery and equipment, incl. planers, saws, band saws, paint shop equipment, etc., to replace that which was recently destroyed by fire.

Pa., Nicholson—Nicholson Toy Factory— complete machinery and equipment for 3 unit toy factory, now under construction.

Pa., Oil City—Ohio Baking Co., Relief St.—wholesale bakeshop equipment and machinery (excluding ovens).

Pa., Perryopolis—Bd. Educ.—complete vocational equipment for $110,000 school.

Pa., Phila.—William Wenkenbachs Sons, Inc., 1314 Germantown Ave.—wagon wheel hub boring machine, electrically driven.

Pa., Pittsburgh—Carnegie Steel Co., Carnegie Bldg., C. R. Miller, Jr., Purch. Agt.— two 5 ton jib spout cranes for Edgar Thomson Wks. at Braddock.

Pa., Pittsburgh—H. C. Frick Coke Co., Carnegie Bldg., T. S. Duncan, Purch. Agt. —three 2 ton 24 ft. span cranes to run on I beam, 10 ton electric overhead crane and three 1 ton hoists, for Everson, Pa.

Pa., Pittsburgh—Pressed Steel Car Co., Farmers Bank Bldg., J. B. Tate, Purch. Agt.—four 2 ton electric hoists.

Pa., Pottstown—Pottstown Cold Storage Co.—air compressors, air tanks, transmission and other cold storage equipment.

Pa., Scranton—W. LaFontaine, Dir. Pub. Wks.—portable drilling machine.

Pa., Scranton—H. G. and W. A. Smith, Wyoming Ave. and Walnut St.—machinery and equipment for proposed plant for the manufacture of auto springs, wheels and bodies.

Pa., Shippensburg—Bd. Educ.—vocational equipment for $160,000 school here.

Pa., Warren—Conewango Refining Co.— new machinery and equipment incl. transmission and conveying, stills, etc.

Pa., Warren—H. F. Swanson, 217 Pennsylvania Ave.—tire repair machinery and equipment.

Pa., Washington—East Washington Bd. Educ., c/o J. B. McMurray, Washington Trust Bldg.—equipment for manual training department of new high school.

Pa., Wilkes Barre—Wilkes Barre Times & Leader, Times Leader Bldg.—newspaper printing plant machinery and equipment, for addition to plant here.

Tex., Bogota—J. P. Nance—complete newspaper equipment and second hand press.

Tex., Dallas—Dallas Textile Mills Co., J. P. Burrus, Interurban Bldg., Pres.— 12,000 spindles, etc., for proposed cotton mill.

Va., Gloucester—Gloucester Ice & Refrigerating Co., A. Crosby, Pres.—ice manufacturing machinery and equipment.

Va., Marion—Virginia Table Co.—woodworking machinery and equipment for addition to plant.

Va., Mount Sidney—O. M. Sheets (miller) —power corn sheller, capacity 1 bu. per minute.

Va., Nitro—Charleston Paper Mfg. Co., R. C. Stewart, Secy.—pulp mill machinery and equipment.

Va., Richmond—Taylor Parker, Norfolk, Water and Commerce Sts.—4 side wood planers, 8 x 20.

W. Va., Charleston—Ring Hartman Co., Inc., Jannett Bldg., (general contractor)— air compressor, electric hoist and steam hoist.

Wis., Eau Claire—Lange Canning Co., c/o C. J. Lange, Mill and Madison Sts.— pea canning machinery for 2 line plant, power machinery and conveyors for proposed plant at Mason.

Wis., Green Bay—Northwestern Cold Storage Co., 409 North Washington St., C. A. Straubel, Purch. Agt.—refrigeration machinery, several ton capacity.

Wis., Manitowoc — Bd. Educ., E. W. Waite, Supt.—manual training equipment, incl. mechanical drawing sets, table saw, small mortiser and wood working tools, for $400,000 high school.

Wis., Milwaukee—J. Griesemer, 341 39th St.—combination woodworking machine to include rip saw to rip up to 10 in. material, 24 in. band saw and 6 in. joiner (used preferred).

Wis., Milwaukee—Misericordia Hospital, 22nd and Chestnut Sts.—laundry machinery, manglers, etc., for proposed power house and laundry.

Wis., Osseo—Foster Co-operative Creamery Co., c/o B. Wilcox, Route 1—modern creamery machinery incl. separators, churns, weighing machine and shafting.

Wis., Shiocton—W. Schroeder, c/o Fox River Canning Co.—equipment and machinery for proposed kraut factory, cutters, choppers, power machinery, belting and shafting.

Wis., Springfield Corners—Endres Bros. Co.—machinery and equipment for manufacture of auxiliary oiling device for Ford cars, for proposed plant at Waunakee.

Wis., Superior—Superior Paint Mfg. Co., 5 Wisconsin Blk.—pigment grinding machinery.

Wis., Waukesha — Waukesha Washed Sand & Gravel Co., G. Brew, Mgr.—electrically operated washing and crushing machinery for gravel pits at Madison, Wis. Also bucket conveyors, tracking, belting and shafting.

Man., Winnipeg—Canadian National Ry. (Western Div.), Union Station, H. A. Dixon, Ch. Engr.—oil handling equipment at Smithers and Prince George, Alta., also one 300 ton mechanical coaling plant, at Redditt, Man.

Ont., Bradford — S .Lukes — complete equipment for flour mill, to replace that which was destroyed by fire.

Ont., Carleton Pl.—Hawthorn Mills, Ltd. (textile goods)—one steam finishing machine for steam lustering face finished goods.

Ont., Cooksville—Cooksville Shale Brick Co.—additional brick making equipment.

Ont., Toronto—City, R. C. Harris, City Hall, Engr.—equipment for elevating and conveying sand and gravel in Municipal Yards, probably electric power.

Ont., Toronto — Wasapika Consolidated Ltd., c/o Simons, Agnew & Co., McKinnon Bldg.—200 ton mill for crushing ore at Wasapuka, Ont.

Que., Coteau du Lac—J. Menard—additional equipment for door manufacturing plant.

Que., Danville—Faucher & Guilbert—saw mill machinery.

Que., Farnham — Pollender & Freres, Jacques Cartier St. (manufacturer of doors)—moulder, panel raiser, etc.

Que., Huntingville — W. H. Hunting & Son (flour mills)—flour mill machinery.

Que., Montreal—E. J. Mayo & Co., 645 Chambord St., P. Merinier, Mgr.—sawing equipment for the manufacture of lathes.

Que., Montreal—Teck Hughes, Ltd., c/o Simons Agnew & Co., 189 St. James St.—entire new mill to handle upwards of 200 tons of ore daily.

Que., Robertsonville—G. Rosseau—additional saw mill machinery.

Que., St. Alexis des Monts — National Wood Turning Co., Ltd., J. Chicoine, Purch. Agt.—woodworking machinery.

Que., St. Hyacinthe — Chaussures Rita, Ltd.—additional shoe manufacturing machinery.

Que., Ste. Julienne—S. Simard—equipment for saw mill.

Que., St. Mathieu de Caxton—A. Gelinas—equipment for saw mill.

Que., Sillery—Quebec Pulp & Paper Co., Ltd.—equipment for sulphite and newsprint paper plant.

Que., Waterloo—Roxton Mill & Chair Mfg. Co., Ltd., J. H. Poirier, Purch. Agt.—woodworking machinery.

Metal Working Shops

Calif., Los Angeles — Biltmore Garage Corp. is having plans prepared by Stanton, Reed & Hibbard, Archts., Metropolitan Bldg., for an 8 story, 114 x 165 ft. garage on 4th and Olive Sts. Estimated cost $350,000.

Calif., Los Angeles—The Los Angeles Ry. Co., Los Angeles Ry. Bldg., is having plans prepared for the construction of a shop on 54th St. Estimated cost $85,000. Private plans.

Calif., Los Angeles—R. T. Warner, c/o C. F. Skilling, archt., Bradburg Bldg., has had plans prepared for the construction of a 1 story, 50 x 150 ft., garage on South Figueroa St.

Calif., San Francisco—Amer. Concrete Co., Humboldt Bank Bldg., will build 2 story garage on McAllister St. near Central Ave. Estimated cost $40,000.

Calif., San Francisco—W. L. Hogan, 333 Kearny St., awarded the contract for the construction of a 1 story 275 x 275 ft. garage and store building on North East Howard and 5th Sts.

Calif., San Rafael—Pacific Gas & Electric Co., 445 Sutter Ave., San Francisco, is having plans prepared for the construction of a meter shop, garage, warehouse, paint shop, etc., all 1 story, here. Estimated cost $41,500. Private plans.

Calif., South San Francisco — Metal & Thermit Corp., c/o Swift & Co.:, is receiving bids for the construction of rolling mill buildings on Swift Ave. Estimated cost $2,000,000. E. W. Kardos, Dist. Mgr. Private plans.

Conn., Hartford—L. G. Carroll, 24 Allyn St., awarded the contract for the construction of a 3 story, 30 x 90 ft. garage at 104 Trumbull St. Estimated cost $50,000. Noted Apr. 26.

Conn., Southington—Peck, Stowe & Wilcox awarded the contract for the construction of a 70 x 100 ft. hardening and annealing plant. Estimated cost $125,000.

Ill., Chicago—Fox & Fox, Archts., 38 South Dearborn St., are receiving bids for the construction of a 1 story, 105 x 300 ft., factory, for the manufacture of copper rod and wire, at Kedzie Ave. and Drainage Canal, for Brenner, Monley & Merris, c/o architects. Estimated cost $300,000.

Ill., Chicago — Hotel La Salle Co., 110 North La Salle St., awarded the contract for the construction of a 6 story, 40 x 180 ft. garage at 209-11 West Washington St. Estimated cost $200,000.

Ill., Chicago—N. Schoenbrod, c/o Rissman & Hirschfeld, Archts., 64 West Randolph St., having plans prepared for the construction of a 1 story, 50 x 177 ft. autosales building and garage at 2520-24 South Michigan St. Estimated cost $65,000.

Ind., South Bend—The Studebaker Corp., Main and Bronson Sts., has had plans prepared by A. Kahn, Archt., 1000 Marquette Bldg., Detroit, Mich., 1 story, 660 x 683 ft. foundry, containing molding room, core room, etc., on Prairie Ave.

Mich., Battle Creek — Michigan Metal Products Co. is having plans prepared for the construction of a 1 story, 60 x 100 ft. addition to its factory. Estimated cost $25,000. A. B. Chanel, Battle Creek, Archt.

Mich., Detroit—Detroit Steel Co., 6189 Hamilton Ave., soon lets contract for the construction of a 1 and 2 story, 80 x 150 ft., 80 x 250 ft. and 50 x 150 ft. steel mill buildings, on Fort Blvd. Bonnah & Chaffee, 528 Farwell Bldg., Archts.

Minn., Minneapolis — Hohn & Tuscany Co., 735 Temple Court, will build 1 story and basement, 66 x 200 ft. garage at 2820 Hennepin Ave. Estimated cost $40,000. P. E. Crosier, 915 New York Life Bldg., Engr. and Archt.

Miss., St. Louis—Scullin Steel Co., 6700 Manchester Ave., will build a 1 story, 33 x 61 ft. furnace for steel plant on Knox Ave. Estimated cost $15,000.

Mo., Kansas City—Benard & Buchli Motor Co., 4041 Bway., had plans prepared for the construction of a 1 story and basement, 65 x 130 ft. garage on Bway. and Schaefer Sts. Estimated cost $40,000. E. C. Faris, 3908 Central St., Archt.

Mo., St. Louis—A. Leschen & Sons Rope Co., 5909 Kennerly Ave., awarded the contract for the construction of a 1 story, 77 x 308 ft. wire factory, on Kennerly Ave. Estimated cost $75,000.

Mo., St. Louis—The Missouri Pacific Ry., Railway Exch. Bldg., will build a 1 story, 50 x 80 ft. shop on Chouteau Ave. Estimated cost $12,000.

Mo., St. Louis—J. Pavelka, 1227 Kraft St., awarded the contract for the construction of a 1 story, 42 x 60 ft. tool factory on Tower Grove Ave. Estimated cost $10,000. Utility Tool Co., 620 Tower Grove Ave., Lessee.

Mo., St. Louis—B. M. Rasmussen Real Estate Investment Co., Liberty Hotel, awarded the contract for the construction of a 1 story, 100 x 144 ft. garage at 2003-09 Lucas Ave. Estimated cost $41,000.

Mo., St. Louis—J. Volk, 2623 Montgomery St., will build a 1 story, 49 x 78 ft. ornamental iron shop at 3674 Clark Ave. Estimated cost $5,000.

Mo., St. Louis—The Walsh Motor Corp., 4919 Delmar Blvd., awarded the contract for the construction of a 2 story, 100 x 170 ft. garage and automobile show room at 5127-5135 Delmar Blvd. Estimated cost $85,000.

N. J., Trenton—Magnetic Pigment Co., 601 Cass St., awarded the contract for the construction of a 4 story, 45 x 65 ft. addition to its plant. Estimated cost $40,000.

N. Y., Albany—A. Kupenberg awarded the contract for the construction of a garage at 41-47 Columbia St. Estimated cost $125,000.

N. Y., Brooklyn—S. Abels, c/o M. A. Cantor, Engr. and Archt., 371 Fulton St., will build 1 story garage on Bridge St. Estimated cost $65,000. Work will be done by separate contracts.

N. Y., Buffalo—The Fillmore Ave. Fdry. & Iron Co., Inc., 153 Fillmore Ave., plans to build an addition to its foundry. Estimated cost $8,000.

N. Y., Jamestown—The Jamestown Gas Stove Corp., Corry, Pa., is having plans prepared for the construction of a stove factory, here. Estimated cost $50,000. Engineer and architect not announced.

N. Y., Niagara Falls—The Gazette Publishing Co., 310 Niagara St., has awarded the contract for the construction of a 3 story, 33 x 132 ft. newspaper plant. Estimated cost $50,000.

O., Akron—Taplin-Rice-Clerkin Co., 177 South Bway., is having plans prepared for the construction of a 2 story foundry to replace the one recently destroyed by fire. Estimated cost $125,000. Carmichael Constr. Co., 524 Hamilton Bldg., Archts.

O., Cleveland—The Amer. Tube & Pipe Bending Co., c/o S. Firestone, Pres., 880 East 72nd St., is having plans prepared for the construction of a 1 story, 100 x 120 ft. factory on Berea Rd. Estimated cost $50,000. Private plans.

O., Cleveland—A. Greenwald, Society for Savings Bldg., is receiving bids until May 18 for a 1 story, 125 x 135 ft. warehouse and garage at 1215 Central Ave. Estimated cost $50,000. N. Petti, Williamson Bldg., Archt.

O., Cleveland—L. B. Koblitz, Leader News Bldg., is having plans prepared for the construction of a 1 story garage on Cedar Ave. near East 106th St. Estimated cost $50,000. Private plans. Red Top Cab Co., 1532 Lakeside Ave., lessee.

O., Cleveland—The Princeton Realty & Investment Co., Cleveland Discount Bldg., has had plans prepared for the construction of a 1 story, 37 x 60 ft. commercial building and a 32 x 140 ft. garage. Estimated cost $50,000. E. A. Kraus, Cleveland Discount Bldg., Archt.

O., Elyria—Superior Metal Products Co., Bond and Adams Sts., awarded the contract for the construction of a 1 story, 60 x 160 ft. factory. Estimated cost $40,000.

Pa., Cresson—Link Motor Co. awarded the contract for the construction of a 2 story and part basement, 70 x 100 ft. garage on Laurel Ave. Estimated cost $50,000.

Pa., Danville—The Danville Galvanizing Co. plans to build a metal working plant. Estimated cost $50,000. Engineer or architect not announced.

Pa., Ebensburg—The Gardner Calculating Machine Co. is receiving bids for the construction of a 2 story and basement, 90 x 100 ft. factory on High St. Estimated cost $70,000. Private plans.

Pa., Franklin—Franklin Steel Wks. plans a 1 story, 45 x 425 ft. addition to its plant. Private plans.

Pa., Galeton—Keystone Garage Co. will construct a 1 story and basement, 75 x 120 ft. garage. Estimated cost $40,000. H. Haskell, Hulett Bldg., Elmira, N. Y., Archt.

Pa., Johnstown—The Trabold Motor Co., 429 Swank Bldg., will build a 1 story, 90 x 220 ft. auto truck factory, Ferndale Ave. Private plans. Noted Mar. 29.

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